

SIMPLE IMPROVEMENTS TO YOUR SET

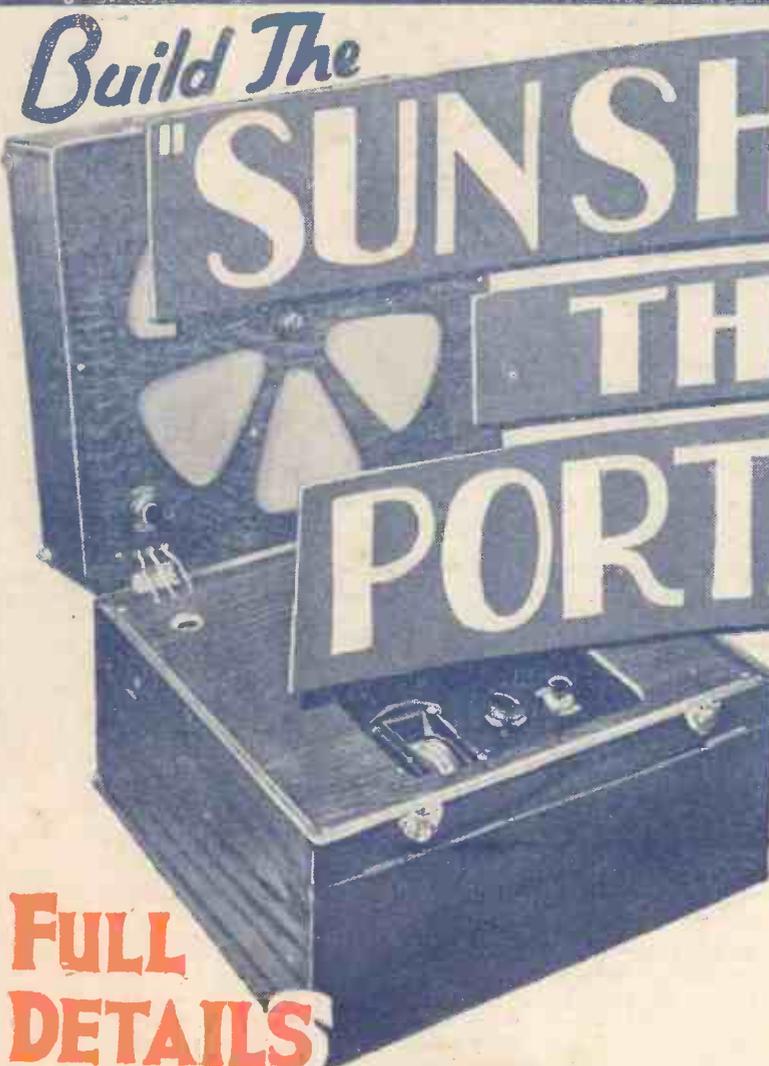
# Amateur Wireless

Every Thursday 3<sup>d</sup>  
and  
Radiovision

Vol. XVI. No. 418

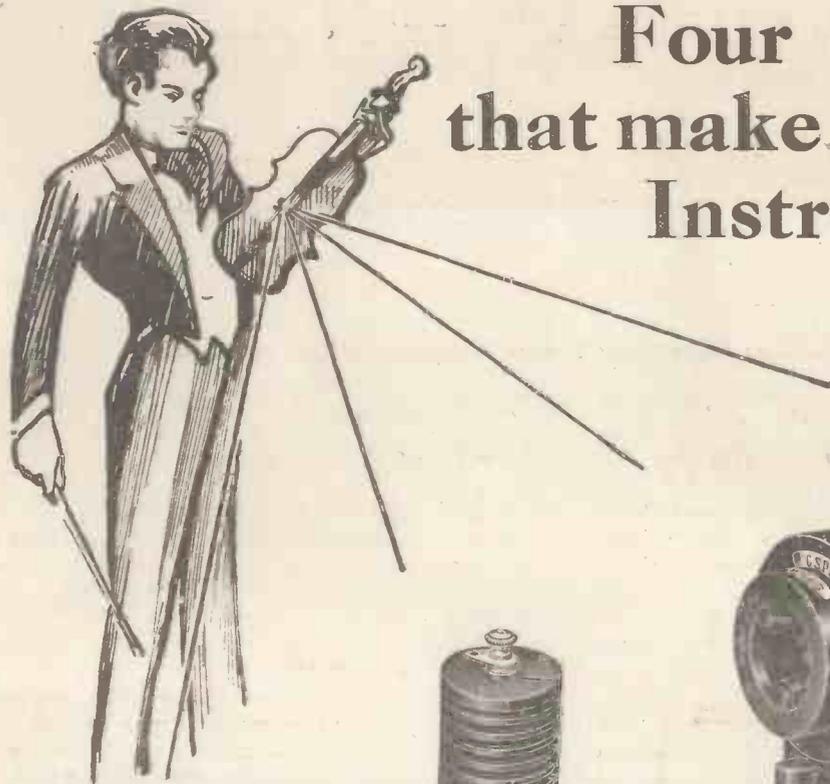
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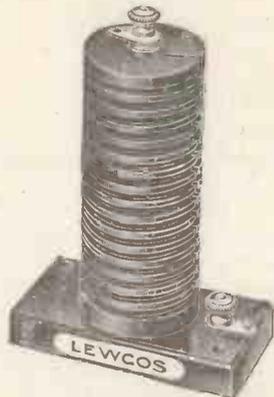
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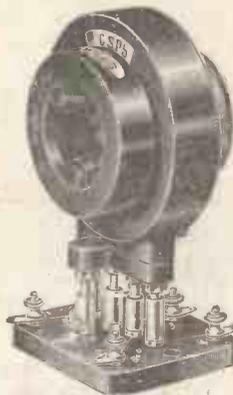
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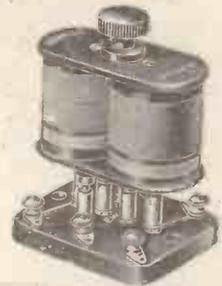
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# Amateur Wireless and Radiovision

The Leading Radio Weekly for the Constructor, Listener and Experimenter

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## The "M.D."—The B.B.C. and "Safety First"—Helping the Unemployed— India's Radio Trouble—Radio in S.A.—Lucky Crystallisers

**The "M.D."**—Last week we announced that Dr. Adrian Boulton has taken up his new duties as Musical Director of the B.B.C. Already the "M.D." (this is not an impolite term, for Sir John Reith is dubbed the "D.G." in Savoy Hill parlance) is a busy man, and has had to spend a deal of

(only those who can talk into a microphone being eligible!) during the hours devoted to schools transmissions." So says *The Autocar*, and we suspect the popular figure of that journal, Mr. "Sammy" C. H. Davis of being largely responsible for the bright thought

And he should know, being himself an experienced "eye-witness" broadcaster of racing events.

**Helping the Unemployed**— "Why doesn't the B.B.C. help the thousands of poor fellows who cannot get jobs," writes a North London reader. "At present we have to watch the papers, and a lot of time is wasted before we can follow up the advertisements. Surely the B.B.C. can spare 10

minutes of the news bulletin time to broadcast jobs." It might interest readers with similar views to know that the Japanese Government already broadcasts offers of employment from the Tokyo station.

have here come from the States. One gets accustomed to seeing so many Fords and knowing that British motor manufacturers are forgetting the markets overseas, but it is a sad state of affairs when this American monopoly spreads to small parts such as radio gadgets."

**Lucky Crystallisers**—The way some of our Continental friends forget their responsibilities in the ether is amazing in its sheer frankness. For instance, a report from a Continental correspondent says that Budapest is planning to have a dual 120 kilowatt giant station on the same lines as Brookman's Park, but four times as big to give "satisfactory service to crystal users in every part of the country." Well, it's all very nice for the crystal users near Budapest, but a dual 120-kilowatt station is going to upset the applecart of the European ether.

**A "Four" for Summer Work**—Summer—real summer—is a long time in coming, and while the garden isn't looking any too grand, the present spell of weather has an advantage from the radio point of view, for reception conditions are good just now. But when the fine weather does come, then reception will slowly get poorer and poorer—and good sets will be in demand. Next week we are giving details of a new four-valver, a real summer-time DX set.



Radio from the far North. Carl Petersen, the radio operator of the Byrd Expedition, keeps in touch with civilisation by means of a short-wave set

time tackling Press men—an inevitable task of the famous, nowadays. He has been the director of the Birmingham City Orchestra since 1924. He was educated at Westminster and Christ Church, Oxford, being president of the Oxford University Musical Club in 1910. Since 1918 he has conducted for the Royal Philharmonic Society, the Liverpool Philharmonic Society, and has also conducted the London Symphony, Queen's Hall, and Royal Albert Hall Orchestras, as well as a season of Russian ballet at the Empire Theatre and concerts in Vienna, Munich, Prague, Barcelona, and the United States.

**The B.B.C. and "Safety First"**— "Short lessons in 'Safety First' principles and practice need not be dull. They could be made really enthralling, but the instructors would have to be well 'up' in their subject. The B.B.C. might help by having many more 'Safety First' talks by experts

minutes of the news bulletin time to broadcast jobs." It might interest readers with similar views to know that the Japanese Government already broadcasts offers of employment from the Tokyo station.

**India's Radio Trouble**—Ghandi's domestic bothers in India have rather overshadowed the radio trouble which was going on there, the old Indian Broadcasting Company having ceased to exist. As a matter of fact the Government has taken over the concern and given it the grandiose title of the "Indian State Broadcasting Service."

**Radio in S.A.**—"You'll be sorry to hear that I am running a set built almost entirely of American parts," writes J. B. in Johannesburg, South Africa, "I could not bring an AMATEUR WIRELESS set back with me after my leave because of the import duties, and the only good parts we

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# RADIO PICTURES ON 'PLANES

*An Account of a New Wireless Picture System for use in Aircraft*



ORDINARY wireless pictures have proved to have a fair degree of utility in connection with aircraft. For example, a Fultograph is being carried on the R100 on its trip to Canada and will be used for receiving weather charts transmitted from Cardington. A similar test was made some time ago in order to locate the position of generation of atmospheric, these showing up as black marks on a graph transmitted on the wireless picture apparatus, and thus indicating the exact second at which they occurred.

The American Army Air Corps has been making tests with a new method of transmitting pictures by wireless, the picture transmitting and receiving apparatus having been specially made by Westinghouse. The great advantage of this new method



A specimen message transmitted by the Westinghouse system

is a pilot may write the messages he has to transmit upon a sheet of ordinary writing paper, using a soft lead pencil. No special negative is necessary for transmission, as is the case with some wireless picture systems. The Air Corps has been carrying out tests for the last two months with a plane flying over the Mather Field aerodrome in California, and many pictures have been transmitted from the aeroplane to the ground station.

When it is found that the reliability is

quite satisfactory the aeroplane will also be fitted with a receiver so that pictures can be sent in both directions. The Westinghouse apparatus used is very simple. The paper bearing the message is wrapped around a metal cylinder, much the same in size and appearance as the cylinders used in dictaphone machines. This cylinder, driven by a small motor, revolves, and moves slowly from left to right. As it does so, the paper passes under an intense light spot from a car type headlamp. The white paper reflects the light, but the black marks of the pencil do not.

These variations of light and darkness are changed by the cell into electric impulses which in turn are passed through an L.F. amplifier and then to the transmitter.

The receiver picks up the signals and puts them through an amplifier, which rectifies the current, and then passes them on to the recording apparatus. Instead of changing the electrical impulses into light again, as in previously demonstrated equipment, the Westinghouse apparatus reproduces the picture by chemical action in the paper, as in the Fultograph system.

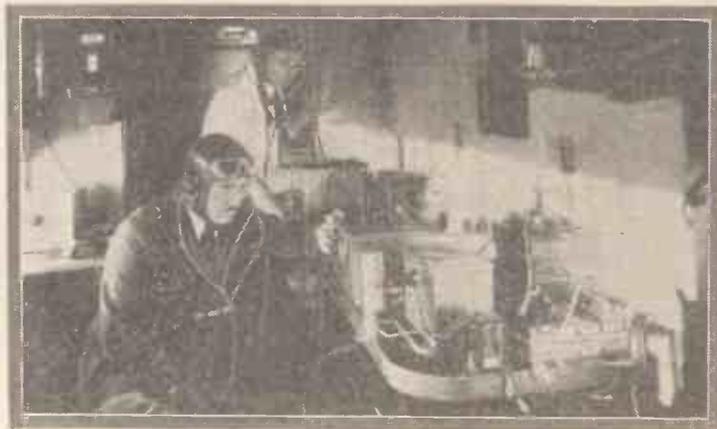
To accomplish this, the special paper from the roll is passed first through a little water bath in front of the receiver, and thence over a cylinder which is rotating in synchronism with the transmitting cylinder. No special arrangements are used for synchronising.

Stationary contacts arranged above the horizontal cylinder are connected to a stylus bearing on the surface of the paper. The paper slowly advances through the receiver, the motion being exactly the same

as that of the transmitting cylinder. Therefore the two motions reproduce exactly the scanning of the photograph by the transmitter to re-create the image on the paper as the varying current produces more or less chemical change in the paper.

The whole apparatus is made as self-contained as possible and it needs no great amount of skill to work. This is an important point. The initial tests which have been made show that this new radio picture system is well suited to army aircraft working.

It is understood that the chemically-



Transmitting a picture from an aeroplane in flight

prepared paper used is different from that used in the Fultograph system, and gives a black image on the white paper.

U.

The first radio-equipped police car in St. Louis, Mo., has just been successfully tested. The police broadcasting station is in course of construction and will cost £7,000.

Communication has now been established by means of a portable wireless plant between the Shetland Islands and the mainland. The community had been completely isolated after the snapping of the direct cable from Lerwick, and this has caused the greatest indignation, as the cable has been faulty for several months without being repaired. The portable wireless was sent from Aberdeen by steamer and was erected at the dismantled wireless station near Lerwick, messages being transmitted through Wick.



# Simple Improvements To Your Set

- Remote Volume Control
- Smooth Reaction
- Curing "Plops"
- A Meter Sentinel

Practically every receiver can be improved in one way or another. Here are some simple suggestions by **KENNETH ULLYETT**

**J**UMPING up and down to switch on and off the set in between undesirable items is a thing I could never tolerate, and the surprising thing is that so many listeners put up not only with this elementary inconvenience but they do not fit a remote volume control and therefore have to be constantly getting up and down to smooth down the "peaks" of a soprano's top notes or boost up the faint whispers.

A remote volume control is not so important in a gramophone because, anyway, one has to be walking to and from the set to change the records every three or four minutes, and the volume graduations of a good record should not need a superimposed control by the volume knob—although the cheaper records could often be improved.

A volume control of the variable grid-leak type is perhaps best in the set itself,

placed in the L.T. circuit of the detector.

Preferably, the rheostat should be of a type which does not break contact when in the minimum position, for this would switch off the H.F. valve (or detector, as the case may be) and leave one to think that the whole set was switched off. A separate switch should be in the main L.T. circuit, and this, too, can be on a length of flex.

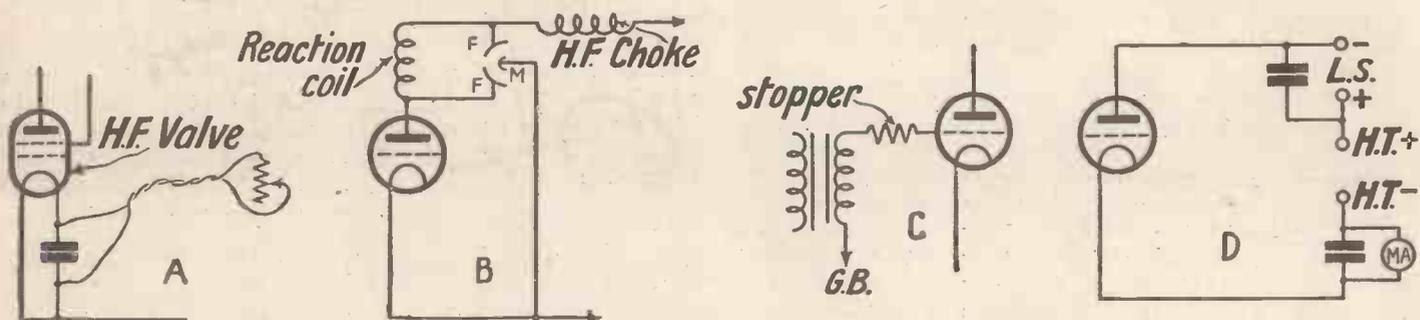
### Remote Control

The connections for the extended volume control are shown in the little diagram A below, and it will be seen that the flex leads are shunted at the set end by a condenser. Generally this will not be necessary but if the flex is very long the presence of the condenser (which can be anything over about .1-microfarad) seems to prevent H.F. instability which otherwise may occur.

scheme, even with swinging coil reaction, which can thus easily be modified.

Little troubles sometimes arise in a set because the H.F. choke is not quite the correct one for its job, or because the circuit employed is a difficult one for any choke which has to cover a wide wavelength range. If this trouble is present in your set it will manifest itself in the way of motorboating at certain settings of the reaction knob, failure to oscillate at certain tuning points and howling on the threshold of reaction.

Often one may try several chokes without curing matters, and a very simple cure for most of these troubles is to fit a stopper resistance in the grid circuit of the L.F. valve immediately following the detector. The resistance can be of the grid-leak type—there is no need to use a wire-wound leak—and the resistance should be about



Here are the connections for four of the simple ideas referred to in the accompanying article

but is at a disadvantage when used as a remote control because it means extending the grid circuit leads, and so increasing the possibility of L.F. ripple and mains hum.

What is wanted is a volume control and an L.T. switch on a little hand panel, on a length of flex. Personally, I find the best extended volume control is a rheostat in the L.T. circuit of the S.G. H.F. valve, and as so many sets nowadays have an S.G. stage this is usually convenient. Use a fairly stout flex because an appreciable voltage drop is the result of using thin wire, and this means that the filament never has the full L.T. voltage applied to it, even with the resistance all out. In sets that have no H.F. stage the rheostat can generally be

And, while talking of H.F. matters, there are many sets in which the reaction control is not all that it might be.

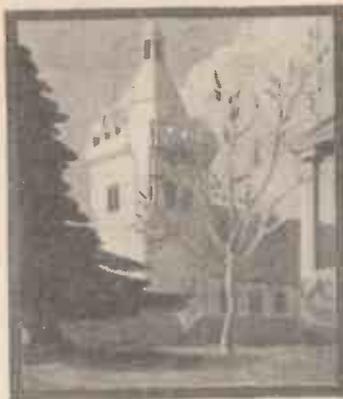
This may be the fault of the condenser used, or the connections of the coil and condenser; and may a kind fate help you if in these days you are still using straight-forward swinging-coil reaction! The latest reaction idea is the differential condenser, and this gives a very nice control of oscillation. There are several ways in which a differential condenser may be fitted, and the diagram B shows one very convenient scheme of connections. The moving vanes are connected to earth and the fixed plates of the condenser are connected one to each side of the reaction coil. This is a good

10,000 ohms. The diagram C shows the connections.

Some time ago I had a bit of a bother with "mixing" valves and run-down H.T.'s and as a result of little troubles arising from this, I resolved to keep a milliammeter permanently wired in the negative H.T. lead so that it would act as a sentinel to all the valves.

My own meter is of the "pill-box" type and gives a reading reliable to about a half a milliamp. There is no need to use anything of an accurately calibrated nature, nor is there any need to have the meter on the panel. I have put mine down by the terminal strip at the back so that two inch-

(Continued on page 778)



# Continental Nights

## The Bell of Toulouse

By J. GODCHAUX ABRAHAM

**D**ONG, Dong, Dong, Dong, at one-second intervals, perhaps ten times, perhaps more, and then a familiar voice: "Allo! Allo! Ici Radio Toulouse. Chers auditeurs, veuillez écouter . . ." Jean Roye, who has acted as "le speaker," or announcer to that station for many years, considers all listeners his personal friends, and so addresses them in this manner. He adopted this formula in the early days when Radio Toulouse was but a weakling and was only heard by an audience in its immediate locality; since that date it has grown and ranks as an 8-kilowatt, with the result to-day that Jean Roye speaks to thousands of listeners far beyond the boundaries of Europe. His voice has been heard in Ceylon, in California and even in the backwoods of Canada.

### The Best-heard Continental Station

Possibly since its first broadcast on April 15, 1925, Radio Toulouse, owned by the Radiophonie du Midi, can claim the title of being the best heard of the European transmitters; in any case, of the French stations it is the one most familiar to the ears of British listeners. Ask any radio fan; ask young Smith who only recently put together a two-valver; he will tell you that he got Radio Toulouse and another foreigner. Be assured that in every log Toulouse is bound to be found. Now, why should it be heard so well? Well, it happens to be situated in a very favourable position; this may be due to mere luck or it may show considerable perspicacity on the part of its constructors, I should not like to say. The transmitter was housed at the start in a private house of some size, the Villa Schmit on the top of La Colline de Balma, dominating the city. It is some two miles from anywhere, and as the country for sixty kilometres around is as flat as a pancake, there exists nothing in the landscape to blanket the transmissions. Radio Toulouse appears to be picked up as easily in Norway and Germany as it is in Spain and Italy.

### The Toulouse Bell

At most times of the day you will find the studio at work; this spells the presence of the announcer with whose deep-toned baritone voice you must be familiar. Apart

from news bulletins, agricultural reports, stock exchange quotations or commercial news of purely local interest, the Radiophonie du Midi does not encourage talks; the studio was opened to provide chunks of entertainment and it endeavours to do so to the best of its abilities. It is unfortunate perhaps, that so great a proportion of the time is devoted to the broadcast of gramophone records; it is equally unfortunate that the stock should contain so many old and somewhat out-of-date numbers, but you must remember that no licence fees are collected and that all expenses of operation and maintenance are derived from local subsidies, voluntary contributions and the income secured from microphone publicity. Between each item you will hear the tolling of a bell—an automatic signal—and before you are allowed to listen to the next, you will be given two or even three advertisements. So far as possible they will be carefully edited by the speaker; he may go to the length of clothing them in verse, and from the way he recites the health-giving properties of the proprietary medicine he extols, you might be led to believe that he is one of the grateful clients who tendered the testimonial.

The bell? Well, although monotonous, if there is nothing doing it still proves that Radio Toulouse has not closed down, also assuring you that your set is working, and if you have at that moment switched on it will assist you greatly in identifying the station. The Toulouse signal is unmistakable; in the course of an evening you will certainly pick it up several times.

### Special Broadcasts

Once or twice weekly—Friday is a favoured day—the station offers a gala concert relayed from *Le Theatre du Capitole*; this may alternate with an operatic performance or an equally good concert from the local Conservatorium of Music. It is seldom that a play is included in the programme, although on occasion you may hear one interpreted by the *Midi-Artistes*, a studio troupe of actors drawn from the neighbouring theatres.

At the close of the evening, Radio Toulouse now takes full advantage of its author-

ity to use the telephone system, and for an hour or so on Mondays we may be switched over to the Grand Café Sion, one of the city's most popular rendezvous, or on Wednesdays to the Café des Américains, another well-frequented restaurant. On other weekdays we are taken to the Cinema Royal or to the Paramount Palace, two of the leading "movie" houses, from which both real and canned music is relayed.

The late bulletin, which generally includes a summary of the day's topical broadcasts, usually contains late items of general interest; it is called *Le Journal sans Papier*, literally "The newspaper without paper." Curiously enough, for no apparent reason, it is mainly destined to the French residents on the north coast of Africa; its *raison d'être* is barely justified, seeing that Radio Alger, Radio Maroc, and Tunis Kasbah supply a similar service on the spot.

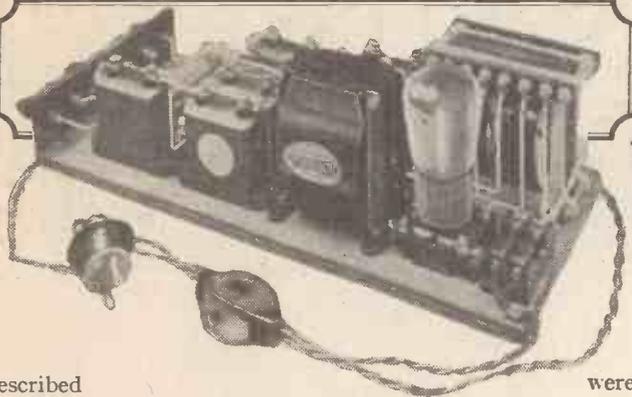
### FOR THE MOTORIST

**I**NCREASING attention is being given to the installation of sets designed to allow the motorist to listen-in whilst actually in motion on the road. The chief difficulty is interference from the ignition system. So long as the engine is running, short-wave interference is being radiated at close quarters. This disturbance can, however, be cut out by copper-shielding the high-tension leads and coil, the distributor and spark-plug, and the low-tension leads.

A short upright or capacity aerial is found to give better results than a frame, the directional effect of the latter being a disadvantage on a winding road. In the case of a saloon car, pick-up can be increased by extending the aerial wire zig-zag fashion over the roof. At least two stages of screened-grid amplification are required to give loud-speaker reproduction over a 50-mile radius. Finally an elastic suspension is essential to minimize microphonic noise due to road shocks. B. A. R.

For the first International Radio Exhibition to be held in Paris on September 26 to October 9, special buildings are to be erected near the Montparnasse railway station in the Quartier Latin.

# An Easily-made ELIMINATOR for A.C. MAINS



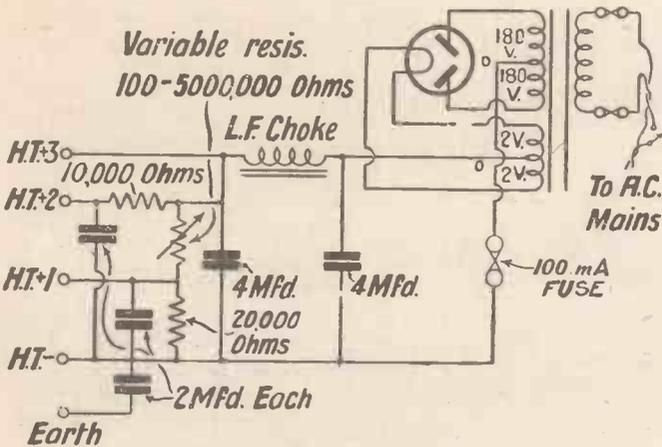
This unit will fit into the battery compartment and—

—supply H.T. current suitable for any set up to a four-valver

THE simple D.C. mains unit described recently in AMATEUR WIRELESS No. 416, proved very popular in spite of the fact that all D.C. mains supplies will in course of time be changed to A.C.

It was pointed out that in view of this change, which must inevitably take place in all D.C. districts within the next year or so, and in some cases within the next few months, it is advisable to make up a D.C. unit only on very good lines so that

is a complete unit which can be slipped into the present battery compartment of almost any set, and a little problem which an intending constructor may have to solve is whether it is better to make up such a unit or to rebuild the receiver itself thus making it completely mains-driven. For this, of course, A.C. valves will have to be used.



This theoretical circuit should be used in conjunction with the wiring plan on the next page

The present unit supplies high-tension current only and the valves will have to continue to be supplied with L.T. by an accumulator. If it is desired to operate the set entirely from A.C. then special A.C. valves and a filament transformer must be provided, but that is another matter.

This unit does not necessitate the use of any special valve, of course, and it simply replaces the existing high-tension battery or H.T. accumulator. Generally

it can easily be modified when the change to A.C. becomes necessary.

A.C. users are fortunately placed, because they can go ahead now with the construction of any mains-driven set or battery eliminator, with the comforting knowledge that it will not need changing for an indefinite period—so far as the mains supply is concerned, at any rate.

What matters is that the mains drive side of an all A.C. set, or an A.C. battery eliminator unit, should be capable of supplying more than the normal amount of current required. This is important, because while one may be working a two-valve set at present, and this can be operated quite satisfactory from the smallest eliminator, it is always advisable to bear in mind the possibility of wanting something bigger, and this in turn may necessitate mains-drive apparatus with a larger output.

Now, this easily-made battery eliminator

the use of a self-contained unit such as this will be found more convenient than rebuilding of the set itself to incorporate the mains drive.

There is always argument as to the relative advantages of valve and metal rectifiers for an A.C. H.T. unit such as this. Many of these pros. and cons. are purely technical, and the one great advantage of the valve rectifier is that while it does not necessitate any more components than are required by the metal rectifier, it is cheap. The initial cost of this unit is therefore appreciably lower than

were a metal rectifier employed.

The components required are few in number as will be seen from the following list:—

Mains transformer, with following output 2-0-2 volts, 180-0-180 volts (Parmeko, Wearite).

Twin baseboard-mounting fuse (Bulgin, No. 3).

Valve holder (Junit, Benjamin, Trix, Wearite, W.B., Formo, Burton, Igranic).

Smoothing choke (Ferranti B.1., Lissen, Varley, Igranic, Bulgin).

Seven 2-microfarad fixed condensers (Lissen, T.C.C., Dubilier, Hydra).

20,000-ohm wire-wound resistance with holder (Dubilier, Lissen, Mullard, Igranic, Ferranti, Ready Radio, Varley).

10,000-ohm wire-wound resistance with holder (Dubilier, Lissen, Mullard, Ferranti, Ready Radio, Varley).

Variable resistance (Clarostat "Standard").

Five insulated terminals marked Earth, H.T.—, H.T.+1, H.T.+2, H.T.+3 (Belling-Lee type B, Clix, Burton).

Ebonite strip, 6 in. by 2 in. (Becol).

Baseboard, 14 in. by 6 in. (Pickett).

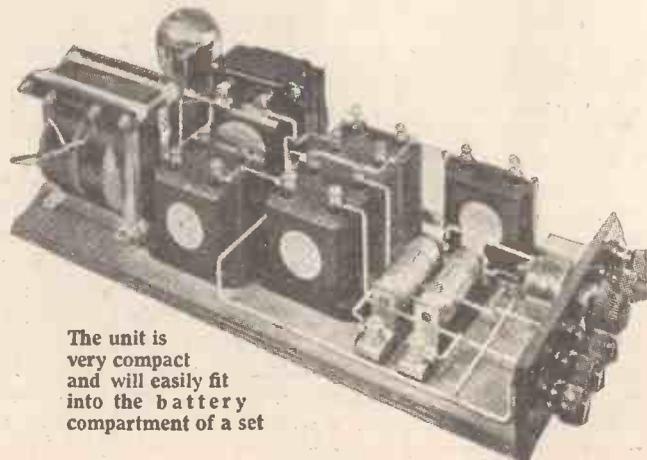
On-off mains switch for flex-mounting (Bulgin).

Length of twin flex (Lewcoflex).

Connecting wire (Glazite).

In any A.C. apparatus it is important to get the spacing of the parts quite correct

(Continued at foot of next page)



The unit is very compact and will easily fit into the battery compartment of a set



# Seeking the Perfect Studio

Ever since the early days of broadcasting, engineers have been trying to find the perfect acoustic arrangements for studios. In this article Alan S. Hunter discusses the desirable characteristics

SINCE the days when 2LO programmes were performed in a small room of Marconi House, there has always been the problem of the acoustically best studio. The early studios, with their heavy drapings, have gradually been modified to allow a natural echo, in contrast with the depressing effect which was originally a feature.

Listeners have frequently commented upon the excellent acoustical effect of the broadcasts from the Grand Hotel, Eastbourne. This location seems ideal for broadcasting, whereas other outside broadcasts are far from ideal. What are the constituents that go to make a pleasing studio, as opposed to one that offends the listener's ear?

In their search for an index as to what determines good and bad studios, engineers have calculated several factors. One of the most commonly used has been that known as "reverberation time." This fearsome phrase refers to the echo effect. It denotes the time taken by a sound to decrease in power by a certain amount.

We have all noted how, in a big, empty hall, our voices echo much longer than in a small room. "Reverberation time" is the mathematical expression of this everyday fact. But it is not a very helpful criterion of a studio's acoustic goodness, because it varies with every studio. What is wanted is a factor that, in studios giving approximately the same degree of æsthetic satisfaction, is constant.

With such a factor, studios could be designed to give any required acoustic

effect. Recent work in the special products department of Bell Laboratories has considerably assisted in the solution of the problem. An intermediate step was made by modifying the "reverberation time" process. This was done by producing a sound from a thousand-cycle source and noting the time taken for it to decay to the point of inaudibility after the source had been cut off. In studios all exhibiting an æsthetic "bestness," this factor was found to be fairly constant.

## The "Decay" Time

According to W. A. Macnair, the real factor determining the acoustic property of a studio has now been isolated. It has been discovered that half the product of the "decay time" and the loudness of the sound source, is a constant factor for all acoustically good studios, irrespective of their size. The discovery is considered to be very important.

The new factor shows what it is that we sense about a studio; it means that when a sound is cut off, we sense a combination of its loudness and the time of its audibility. The æsthetic sense involved is indifferent to the value of the two ingredients, responding only to the quantitative combination. It does not matter, therefore, whether the effect is produced by a loud sound dying out rapidly, or a faint sound slowly.

Up to a point, it will be seen that persistence and intensity in sound are interchangeable. When we speak in a large, empty hall (acoustically "live") the voice

sounds very much louder than in a living-room, even though we do not raise the voice. But, if the "liveliness" of the acoustic effect is carried too far, the voice sounds incoherent in a jumble of echoes.

The opposite effect is produced in the average broadcasting studio, where many speakers are depressed by the apparent weakness of their voices, due to the "deadliness" of the acoustic arrangement.

## "AN EASILY-MADE A.C. ELIMINATOR"

(Continued from preceding page)

and any deviation from the layout shown by experiment to produce hum-free results is really asking for trouble.

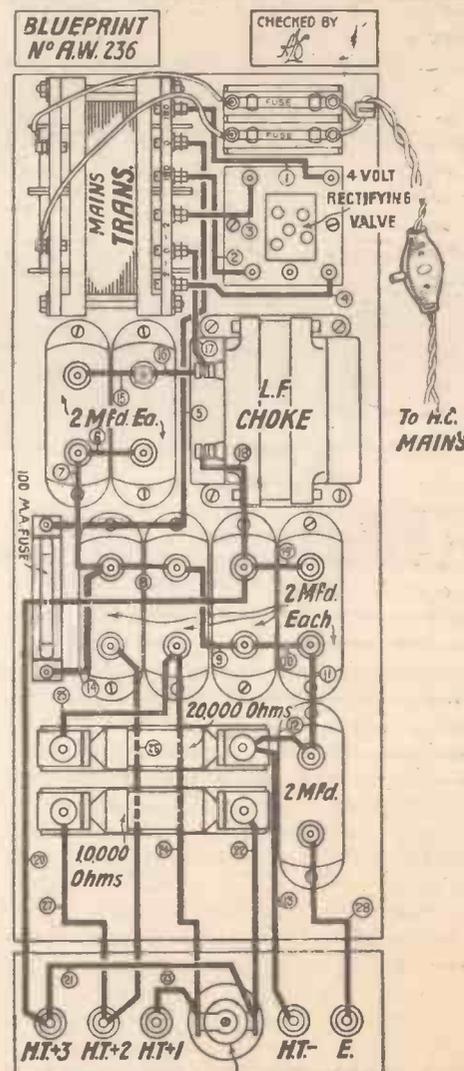
Therefore in this particular instance emphasis is placed on the advisability of making up the unit from the full-sized blueprint, and adhering to this in every particular. A small reproduction of the print is given herewith and the full-sized print is obtainable price 1s., from the Blueprint Department, AMATEUR WIRELESS, 58-61 Fetter Lane, London, E.C.4.

The layout of the parts is very simple, and the unit is built up on a board the

shape and approximately the size of the average H.T. battery. There should be no difficulty about housing the unit.

There is nothing dangerous about a mains unit provided it is made up with good-quality parts and is properly wired from the mains and sufficiently protected against the possibility of "shorts."

The photographs given herewith and the small reproduction of the blueprint will enable many amateurs to make up the unit, but for the benefit of those who want full constructional details, further notes will be given next week. Don't forget that in the meantime the original unit is to be seen in the Somerset Street windows of Messrs. Selfridge & Co., Ltd.



Variable resistance  
100-500,000 Ohms  
The wiring plan. A full-size blueprint is available. price 1s.

# On Your Wavelength!

## How Old is Television?

NO doubt, readers will remember the remarkable feat recently accomplished when some black ink smeared on a card was viewed from a distance of 20,000 miles through the medium of television. I had it recalled to mind this week when reading an article in which this was hailed as a celebration of the eighty-seventh birthday of television. Looking farther into the matter, I found that the first man to achieve television was given as Bain. In 1843 this scientist sent designs by telegraph, using for his transmitter a cylinder covered with tinfoil, on which the lines were drawn in insulating ink. A contact pin was made to travel spirally over the revolving cylinder and contact was made and broken as the insulating lines passed under the contact pin. At the receiving end, by electro-chemical action, a similar synchronised cylinder reproduced the designs directly.

Without in any way detracting from this early work of Bain, surely this process should more properly be regarded as the forerunner of telephoto or facsimile transmissions? The real interpretation of television is the reproduction of sight at a distance. By its aid we see people or events at the instant they take place. We are familiar with the term "poet's licence," but in this case the writer was undoubtedly a victim of mixed definitions, for true television was not accomplished until January, 1926.

## The Jenkins Motor

Two or three weeks ago I referred to the vision apparatus which is being marketed by the Jenkins Television Corporation. I now find that the motor which is employed is really of the Faraday eddy-current type. It consists of six electromagnets operating in conjunction with a toothed rotor and a copper disc. Thus, when used on the same alternating current power system as the television transmitter station it functions as a synchronous motor and synchronism becomes an easy matter. The inclusion of a speed control allows for a slight speed variation, and it is this device which has to be skilfully brought into play when running the apparatus from a different power supply to that of the transmitter. It is claimed that the motor gives almost silent running.

## Image Framing

To frame the image a different method is used from that of Baird. In the British commercial televisions movement of the framing knob rotates the pair of synchronising coils relative to the teeth of the cog wheel. This gives the up and down

movement required. With the Jenkins apparatus the whole of the neon house is raised or lowered or moved to left or right. While the former motion would appear quite satisfactory, I cannot reconcile the horizontal movement. Surely this will take the neon plate outside the area scanned by the 48-disc holes, unless a large overlap is catered for?

It would seem better to alter the disc speed momentarily and thus bring about the hole-phasing between transmitter and receiver discs. A powerful magnifying lens completes the apparatus. As the A.C. frequency in the U.S.A. is 60, the standard transmission is 15 pictures per second as against the British 12½. The slight extra speed will reduce the flicker a trifle, but not to any marked extent.

## Screen-grid Joys

Why is your "Thermion" feeling several inches taller? Why is he likely to need a larger size in hats? No, he has not been taking Bloopo or Mother Cary's Tonic or lurching off concentrated vitamins, or anything of that kind. The fact of the matter is that he has installed something super-super in the way of wireless sets, which works even better than its proud constructor hoped that it would as he drove home the last screw. This is a four-valve containing two screen-grid stages in cascade, a detector, and a low-frequency stage with a super-power output valve.

If you haven't tried two screen-grid stages, make up your mind to do so without delay, no matter if it means begging, borrowing, or stealing the necessary parts. See, though, that you follow, and follow carefully, a first-rate, design, for though two S.G.'s can be heavenly to use it is also quite possible for them to be the other thing unless all the parts used are suitable for the job and most carefully arranged.

## Searching Tests

No time could provide more exacting tests for a receiving set than the summer of the present year of grace. Long-distance conditions are frankly poor and the number of stations receivable with most sets is a small one. Any set which can do well at the present time, then, must be a pretty good one. I made matters still more difficult for my two-screen-gridded by yoking it to an indoor aerial made of No. 18 insulated copper wire, and a gaspipe earth. But even with this poor collector system it gives far better results than the model I used to swear by, which was always used with a good outdoor aerial and an earth plate containing nearly two square yards of sheet copper. The old set had one

screen-grid valve, a detector, and an output pentode. I tried the new one out first of all on the long waves, and found that practically everything that was going could be received at full loud-speaker strength. Ten stations were logged at the first attempt in a run round from Hilversum to Huizen. A flick of the switch changes over to the medium band, and here results were even more surprising.

I am not going to give you the number of stations tuned in on the first evening, for if I did a flood of letters would arrive reminding me of the story of Ananias, and I don't want to risk that. I will just say that on a summer evening, when with an ordinary receiving set the ether seemed pretty dead, this one gave me much the same jolly feeling that one has on a good night in winter when stations are to be found all round the dials.

## Fruits of Progress

The modern two-screen-grid set sums up the results of the enormous advances that have been made in valve and component design during the last couple of years. It is selective enough for anything; it is delightfully simple to operate, since ganging can be employed; its enormous high-frequency amplification reduces the need for reaction to a minimum with the result that quality is better and noisiness is reduced to a negligible amount; efficient volume control devices enable the output from the speaker to be regulated to a nicety. One can thus cut down "Raucous Reg" or "Noisy Nat" to exactly the volume that one wants; and one can cut them out without trouble, owing to the presence of three tuned stages. Altogether, I cannot imagine anything jollier to use or more efficient than a set of this kind.

## Keeping Them in Step

With log mid-line condensers the ganging of closed circuits is usually quite satisfactory, so far as those which are not connected to the aerial are concerned. There is no difficulty about making them work almost exactly in step and, provided that there is plenty of H.F. amplification available, the gains produced by the single control resulting from ganging more than offset any slight losses in strength that there may be through the two circuits not being precisely in resonance at certain points. The grid circuit of the first valve, however, is rather a different problem, for here we have to deal with the damping introduced by aerial capacity. Slight differences between the readings of this condenser and the others are therefore inevitable, but by the use of suitable components they can be kept down to something very small.

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*On Your Wavelength! (continued)*

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Here is a tip which I have found very effective. The necessary apparatus is very simple, and readers may try it out experimentally to see whether it will work in their case before they decide to make it up. The only component needed for the experiment is a semi-variable condenser with a maximum capacity of .0003 or .00025 microfarad. Tune in a medium-wave station with settings somewhere near the middle of the dials. If there are two high-frequency stages, adjust them so that their dials read alike for this station (or if the two are ganged, trim until you get the best tuning). Now for the first condenser. As a general rule, this will read lower than the others. Wire your semi-variable in series between the aerial lead-in and the aerial terminal, and adjust it until the first dial has the same reading as the others. By subsequent adjustments of the semi-variable and the dial of the first variable condenser you will probably be able to make all dials go pretty well in step.

**For the Long Waves**

Quite possibly you will get the dials into step over the medium waveband, but will find that on the long waves the first of them is again showing divergent readings. Try the same experiment with a semi-variable, and if you can get all the dials to work together now, then it is worth while to make up the apparatus, which consists simply of a couple of semi-variables, one for the medium waves and one for the long, with a change-over switch allowing either to be brought into action. In some cases this switch can be ganged with that which operates the wave-change of the coils.

**A Wonderful Broadcast**

Miss Amy Johnson's talk from Brisbane, short though it was, seemed to me a very remarkable piece of good work on the part of the B.B.C. To begin with, the entertainment value of this item was enormous, for everybody was talking at the time about Miss Johnson, and I am sure that every available receiving set was switched on to hear her little message. In this instance, at any rate, the B.B.C. gave the public precisely what it wanted, and I can't imagine that any single listener went in search of an alternative programme.

Technically, too, it was a very fine feat, for it involved the use of the landline between Brisbane and Melbourne, the short-wave beam wireless service between Australia and this country, the landline between the receiving station and 2LO, and the landline again from London to Brookmans Park. Though the total distance to be spanned was some 12,000 miles, the speech came through with perfect quality and the accomplishment of this wonderful piece of relaying reflects the very greatest credit upon all concerned.

**'Ware Dabblers!**

One of the most dangerous people walking about to-day from the wireless owner's point of view is the dabbler. By "dabbler" I mean the kind of fellow whose real trade is that of a tobacconist or a plumber though he has "taken up" wireless and has, somehow, got a local reputation as an expert. I have seen some appalling instances of the things that he can do. Not long ago some friends of mine installed an expensive and very good receiving set, which one evening went on strike. What had actually happened was some simple thing, such as a disconnected lead or something of the kind. They knew nothing about wireless, but had heard that a young shop assistant in the neighbourhood was awfully clever at it.

He was called in, inspected the set, and took it away. A week later it was returned with the panel very badly scratched. It gave some kind of reproduction for an hour or so, and then became silent again. This time its owner sent it up to the makers, who reported that the apparatus has been all but ruined and that it would cost a matter of £7 or £8 to put it right again. The wiring had been changed, good components had been taken out, and bad ones fitted in their places; in fact, the whole thing had been most effectively messed up. Another case concerned a special foolproof set designed for an elderly lady. This was made for local reception only, and was arranged with fixed tuning and a change-over switch, permitting the Regional or the National to be received. A dabbler persuaded her that he could tremendously improve the set. He provided it with adjustable reaction, which was exactly what the designer had avoided, and in the end made such a complete mess of it that it was fit for nothing but the dustbin. If you want wireless repairs carried out, go to a good wireless retailer, who will send your set to the makers if it is suffering from anything that he cannot deal with efficiently himself.

**Another Criminal**

Yet another criminal, also of the dabbler kind, is the man who invests in an accumulator charger and seeks to turn a more or less honest penny, apart from his normal trade or calling. Many of these fellows have absolutely no knowledge whatever of the ways in which accumulators should be treated and though their prices may be a little less than those charged by reputable charging stations, they are much more expensive to employ in the long run owing to the damage that they do. I have heard one of them maintain that the idea that distilled water must be used for electrolyte

was all nonsense, and many of them use ordinary commercial sulphuric acid, which spells very rapid destruction to the plates of accumulators. It is the exception to find any of them possessing a hydrometer, or knowing how to use it if he has one.

A robust low-tension accumulator will stand a good deal in the way of ill-treatment, but high-tension accumulators, with very small cells and lighter plates, demand expert handling if they are to last for a reasonable length of time. I have seen high-tension accumulators of good quality utterly ruined after one or two chargings by people of the kind mentioned. If readers will remember that accumulator charging demands both care and skill, they will be more careful about the people to whom they entrust their batteries and the lives of these will be greatly prolonged.

**Those Chokes**

For small-power valves, and even for super-power valves used singly, almost any well-made choke of suitable inductance value will do. But when you have two super-power valves in parallel with a big plate voltage the current flowing through the choke is considerable, and it must possess a core of large cross section. Should the core be too small, saturation effects manifest themselves and distortion occurs. This is a point that should be borne in mind by anyone who thinks of adapting an existing set for use with a coil-driven loud-speaker.

**Answering a Poser**

All of us are asked perplexing questions at one time or another by our beginner friends, and these questions are sometimes extraordinarily difficult to answer in such a way as to make everything plain sailing to the man or woman who knows nothing whatever about electricity or wireless. A very common one is: "How can wireless waves pass through walls to operate a portable set or any other with a frame aerial?" The layman finds it difficult to conceive that anything can pass through such solid things as bricks and mortar. The best way of dealing with this poser is to point out that glass is equally solid—mention the very thick glass used in the pavement lights of cellars. The beginner will then probably retort that that is easy enough to follow, since glass is transparent.

You can then explain that glass, though transparent to light, is not so to some, at any rate, of the heat waves, and instance the glass fire-screen. Mention also that lead glass is absolutely opaque to X-rays, whereas many solids are completely transparent to them. Working in this way, you will soon be able to get into his head the idea that all substances are transparent or semi-transparent to some rays, but opaque or nearly so to others.

THERMION.

"A.W." Solves your Wireless Problems
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# Are PORTABLES an ENGLISH FASHION?

The question is raised by "Set Tester," who, in this article, gives an account of his tests of the new Philips four-valve portable

AT lunch with an American the other day, talk veered round to portables. I was asked why they are so popular in this country. In turn, I asked the American why "console" sets are so popular in America.

"I suppose it is because they are self-contained instruments," he replied. I told him I thought portables were popular here for the same reason—they are "all in." But the American was not satisfied.

He reminded me that portable gramophones are also extremely popular in England. He thought the English very quaint to want music via portable wireless sets and gramophones. He asked how we tolerated such indifferent quality of reproduction just to have a musical accompaniment at our picnics and river parties.

I disagreed about the quality, contending that some of the latest portables give very tolerable reproduction. Whatever the reasons, portables are still in fashion. At the moment every radio shop is dressing its windows with the latest portable instruments. One of the most interesting newcomers is the Philips.

### Good Cabinet Work

I was fortunate in being allowed to try one of the first batch released. Readers can gather the main outline of the design from the illustrations. They hardly do justice to the extremely fine cabinet work, which is in contrast with the poor containers of many portable sets. The Philips portable is in the "upright" class, as opposed to the suitcase construction favoured by some makers. The neat control panel is at the top, arranged slopingly under a flap, which automatically switches off the set as it closes.

The valve compartment and room for the batteries are provided underneath. The loud-speaker is not on the same side of the cabinet as the control panel. This seems rather queer, although I have no objection

to it. As in all Philips sets, considerable care has been taken in the controls; they are all a pleasure to operate, being beautifully smooth in action. The wave-change lever is a little more incisive in action than is absolutely necessary.

There is only one tuning control. It is a thumb-operated disc, turning a clearly marked scale and two tuning condensers. Sockets are provided for the external connection of an aerial and earth and a

gramophone pick-up. From tests, I do not think an external aerial is needed, unless the reception location is far from a B.B.C. station, or a foreign station is wanted at great strength.

### A Pentode

There are four valves; a screen-grid high-frequency amplifier, a detector and two stages of low-frequency amplification. The last valve is a pentode. The anode current consumption is fairly big for a portable, although it can be kept down by over-biasing the pentode. I should think two months' life is about all that can be expected as the life of the high-tension battery, which is the standard capacity size. I am glad to see that the batteries are an exact fit in their compartment. No additional packing is required, as in some portables.

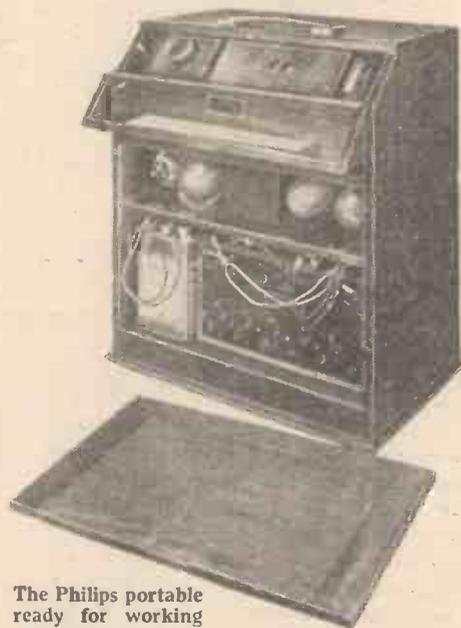
Remembering my remarks on portable set quality, I tried the Philips to see whether I had been justified. The set passed easily proving my contention that a modern portable can give pleasing results even with a small high-tension battery.

Although the grid and anode tuning circuits of the screen-grid valve are "ganged," there is not much loss of sensitivity. A good log of stations was recorded in south-west London. The log of stations provided with the set was verified. Long waves were better than medium waves.

Seven good programmes were picked up on the long waveband. Hilversum, at

40 degrees, Kalundborg, at 53 degrees, Eiffel Tower, at 96 degrees, Daventry at 112 degrees, Berlin at 124 degrees, Paris at 140 degrees and Huizen at 164 degrees, certainly helped to put the B.B.C. in its place.

These stations must not be confused with the innumerable medium-wave stations, varying in strength according to the time of day and even from one minute to another. All the long-wave stations logged were as reliable as Daventry 5XX.



The Philips portable ready for working

The Philips portable was given a further trial at Fittleworth, down in the heart of Sussex. The strength of Daventry was remarkable. No less gratifying was the excellent reception of Hilversum, Kalundborg and Paris.

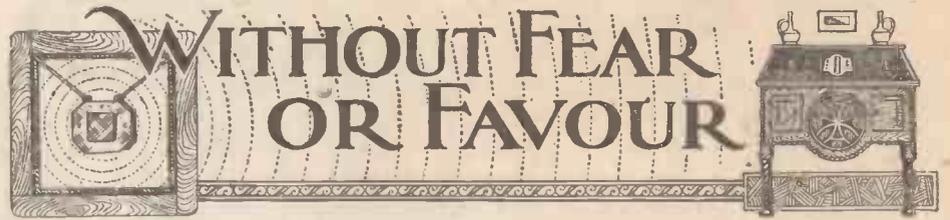
Home again, the same evening, some of the more reliable medium-wave stations were tuned-in while daylight still prevailed. In addition to the National at 21 degrees, London Regional at 65 degrees and Midland Regional at 121 degrees, I got Langenberg at 116 degrees, Rome at 105 degrees, Toulouse at 76 degrees and Turin at 45 degrees. After dark, the stations simply romped in.

### A PAGE FOR THE SET BUYER

Every set referred to in this regular feature by "Set Tester" has reached a certain standard of efficiency in the "Amateur Wireless" Laboratory. Reports are not given on sets that fail to reach this standard. This will explain why reports that do appear express general satisfaction with the set's performance.

## SYDNEY MOSELEY'S WEEKLY PROGRAMME CRITICISM

Those "Ghostly" Themes  
 Dance Band Comparisons  
 The New-style Variety  
 Foreign Transmissions



DO you notice the tendency of B.B.C. playwrights to put over ghostly themes?

The latest, *Copy* (a radio intrigue), was much on the usual pattern, was quite well done, and, since these weird themes are popular, was worth while. But I do wish somebody could think of some original themes to broadcast. There ought to be no many.

I have been doing some reaching out again, particularly over the week-end, with my portable set. Somehow or other, the music that is put over abroad is brighter, and even the old gems seem fresh.

My portable, alas, makes it difficult for me to reach out when the National and Regional programmes are alive! But it is extraordinary the number of hours I can listen to the foreign programmes, particularly on Sunday.

The music is uplifting, and although I must deny the impeachment of a correspondent who thinks I am agnostic, I must say I find "uplift" in the music.

I don't quite understand why the B.B.C. is inviting screen producers to talk on film criticism. It is like asking Mr. Cochran to do "Variety" criticism.

Incidentally, who are the secret critics on whom the B.B.C. seems to rely rather more than they do on public criticism? For instance, I gather that one of the foremost of these secret critics is one who has been universally criticised for having a bad delivery himself. I myself criticised this man in these columns on two or three occasions, and apparently he is permitted to send in secret criticism to the B.B.C. on other speakers. The criticism that is being levelled generally—that there is too much "cliqueism" of modern "refained" gals and boys—is gaining ground.

A dance-band controversy still rages. "Charles," of Earlsway, Chester, is incensed because Jack Payne was placed No. 7 in the list of bands in these notes recently. He thinks Ambrose's Band is No. 1. "The band is a perfect example of tonal balance and is perfect in every way as a dance band."

Next he places Jack Payne, adding:

"For your correspondent's information the orchestrations are by Ray Noble."

The only fault my correspondent finds with Payne is his long drawn-out introductions and codas. Here are his other views of bands which I think are interesting and worth quoting.

"Ambassadors, very good, but subdued; nevertheless, a first-class combination. Jack Harris, a good band, with promise of developing into a first-class 'hot' band. Sydney Kyte, very clean, but nothing to rave about; ensemble very weak. West Endians, very good. Piccadilly Band(s); there are two; Sid Bright is very pleasing; uses string bass, which all dance bands should. Splendide, individually good, but ensemble poor; need a good arranger. Bertini—well, I daren't say it. I'll put it this way: he's much too 'brassy' and the rhythm is 'scatty'."

I think I was one of the first critics to pick out Leonard Henry as the best B.B.C. funny man. I think his recent performances fully justify this claim.

To go back to the foreign transmissions, I wonder whether the B.B.C. listens-in and takes a hint here and there. There is one duet—name I cannot remember—which I heard relayed from Berlin, and three singers on gramophone records, better than any I have heard transmitted from London.



Eddie Childs—a Lissenden cartoon

Many complaints reach me regarding the new type of variety programme.

One correspondent, H.M.G. (Carshalton), summarises the views of all the other listeners who have written to me on the subject. His first grouse is that as a 100-per cent. appreciative listener (*sic*), he religiously listens in the dark. Now he has to light up every time the gong rings in order to find out the name of the next turn. His second grouse is that he misses the studio audiences; "although they often over-did their applause, they were better than a blank silence." Then my correspondent winds up by saying that the new type of variety is a high-brow parody on regular vaudeville, and ought to be done away with.

My impression of John Watt's *Talkie Town* was rather mixed. The singing of the principals and chorus, together with the playing of the "special orchestra," were beautifully rhythmic and catchy. On the other hand, the plot and action were poor. Anona Winn's accents were many and varied—during the performance she sounded Irish, Scotch, Cockney, French, and, at rare intervals, American. But her singing made up for the lapses.

"Vaudeville of Many Countries," given recently, was a good idea; but it proved conclusively what an awful shortage there is of radio variety artistes. All the artistes who took part, with the exception of Greta Keller, have been broadcasting the same sort of stuff for ages; so that, although the idea was sound, there was nothing new in the production.

I see I am being pulled to pieces in the correspondence columns. First one reader avers that I am too much of a high-brow, and then someone else replies that I must be a low-brow, because I devote most of my page to vaudeville and dance bands. In answer to the first gentleman, I would refer him to the other reader's reply.

After all, if I am so interested in dance bands I cannot qualify as a high-brow. Then, again, I would point out to the second gentleman that as a critic I must sort out the items which are open to criticism, and I find that the low-brow items need slanging far more than the high-brow. What am I?

W. JAMES Says:—

# For QUALITY You Must Have STABILITY!



**H**IGH-FREQUENCY currents do no good in a low-frequency amplifier. They are not wanted in this part of the set for several reasons.

The first is that the low-frequency valves are wastefully loaded. Thus, if the L.F. signal is of 6 volts, and the H.F.

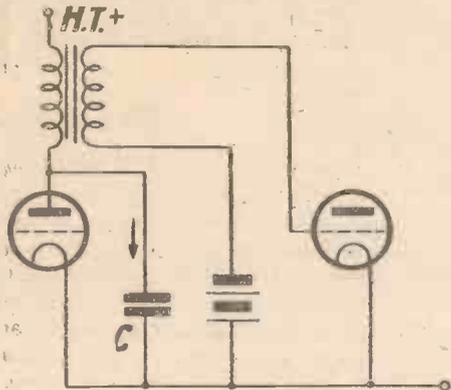


Fig. 1a. An easy path for the H.F. to the filament

amounts to 2 volts, we probably have 8 volts altogether in the circuit.

Now, the L.F. valve may be biased by only 7½ volts. This value of bias would be ample for the L.F. signal alone, but not for the combined H.F. and L.F., with the result that grid current passes and affects the

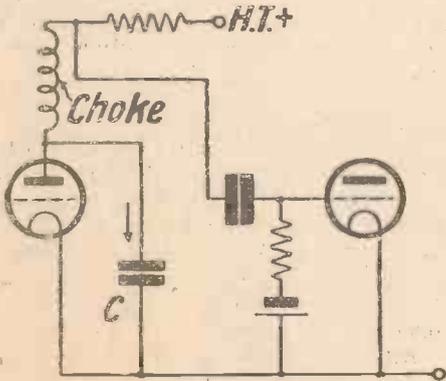


Fig. 2. A useful arrangement when R.C. coupling is used

important still, perhaps. The stray high-frequency currents affect the stability of the set, probably making the reaction fierce, or a howl may be produced when the reaction is adjusted about the oscillation point.

Further, when H.F. currents pass to the loud-speaker they may induce currents into the aerial circuit.

Perfect stability is naturally essential. The user must have effective control of the set and this he cannot have if stray high-frequency currents are flowing through the L.F. amplifier and probably re-entering the set through the aerial or other H.F. circuit.

Here in the anode circuit of the detector, then, is the place to provide apparatus for passing on the low-frequency signal and stopping the high frequency. To effect this we may provide an easy path to the filament from the anode for the H.F. current as in Fig. 1a, or put a high impedance to H.F. in the path of the L.F. current as in Fig. 1b, and a relatively easy escape to earth.

### H.F. Stoppers and L.F. Current

It is necessary to remember that the means for dealing with the H.F. ought not to affect the relative strength of the L.F. and were it not for this the matter would be easy. As it happens, however, the provision of a condenser path to earth, as in Fig. 1a, may affect the amplitude of the low-frequency.

The reactance of a condenser depends upon the frequency of the voltage, decreasing as the frequency is increased. Thus the reactance of a .0003-microfarad condenser when the frequency is 1,000,000 cycles (wavelength 300 metres) is only 500 ohms at 1,500 metres, the frequency being 200,000 cycles, the reactance is 2,500 ohms, and at 5,000 cycles it is 100,000 ohms.

When, therefore, a .0003-microfarad condenser is joined between the anode and earth, we are providing a path of these values of reactance. Clearly, the effect is not so good on the longer wavelengths and, further, although the capacity is only .0003-microfarad, its reactance at 5,000 cycles, which is, of course, a speech frequency, is comparable with the impedance of the low-frequency circuit. When an anode resistance of 100,000 ohms is used the high

notes will, therefore, be reduced in strength, some of the current passing to the filament. Further, the amplification of the high notes is less than that of the lower ones, as the impedance of the anode circuit falls off at the high audio frequencies.

With a transformer, the effect of the shunting capacity may not be so marked.

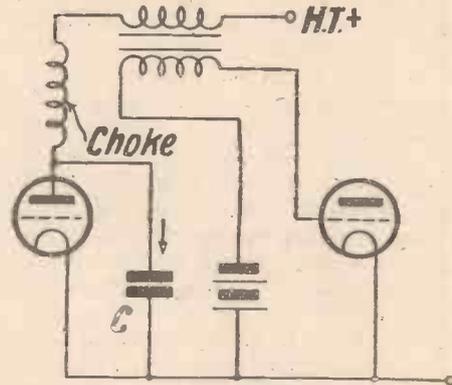


Fig. 1b. High impedance in path of H.F. current

The condenser by-pass of Fig. 1a is the most frequently used scheme, being cheap and fairly effective. Better results may, in certain instances, be obtained by using the elementary form of filter shown in Fig. 1b, however, as the combined action of the H.F. choke and condenser is more effective than

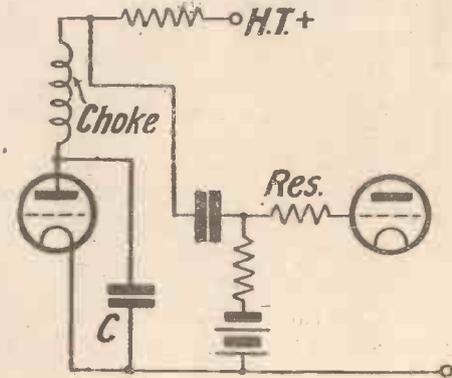


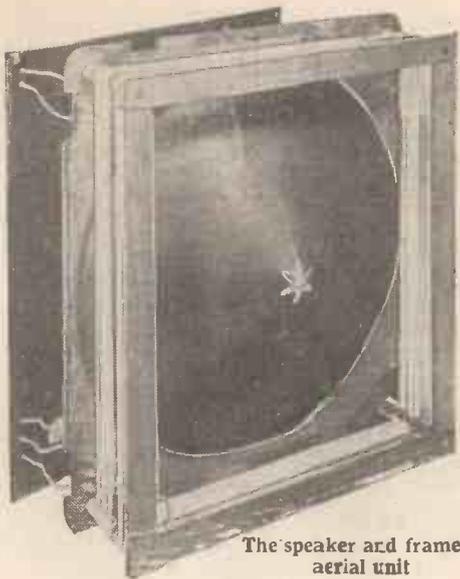
Fig. 3. A commonly used "stopper"

the condenser alone. In explaining the circuit simply, one would say that of the two paths through which the high-frequency

(Continued on page 774)

quality of the reproduction. High-frequency currents are thus definitely harmful for this first reason alone.

But there is a second reason, more im-



The speaker and frame aerial unit

IN last week's issue constructional details were given of the "Sunshine Three Portable." Now we have to consider the frame and the loud-speaker. The loud-speaker used is the Six-Sixty unit, which mounts straight on to the grille.

The frame is now wound and a little care must be taken here, since this is to some extent the heart of a receiver. The short-wave winding is wound in a single layer consisting of 18 turns of 22 d.s.c. wire. The long-wave winding is in three sections wound in slots, 18 turns per slot of 28 d.s.c. wire.

Start to wind your frame from the end remote from the grille. Put on the short-wave winding, five turns being wound on first of all. A tapping is then taken at this point and a further thirteen turns are wound on to complete the winding. The long-wave winding is then commenced, the winding being in the same direction and 18 turns

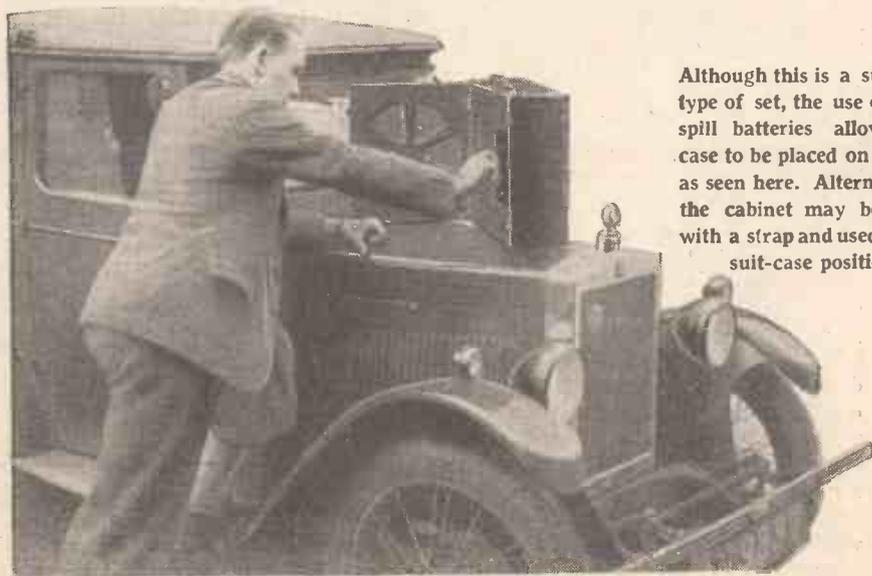
are placed in each of the slots. The wave-change is accomplished by shorting out the long-wave frame with a simple push-pull switch.

One point should be borne in mind particularly, when winding this frame, and that is that the long-wave sections must be kept away as far as possible from the short-wave section. The distance shown on the blueprint is  $\frac{3}{4}$  in. and this must be taken as the minimum. If possible an even greater distance between the sections should be arranged. It is not of great moment if the windings are crowded towards the extreme end of the framework on which they are placed, provided one allows the clearance between them.

**Frame-turns Spacing**

The object of this clearance is to avoid absorption effects in the short-wave position. In the long-wave position, as will be seen from the diagram, all the winding is in use, but on the short waves the long-wave section is short-circuited. If this short-circuited section is close to the short-wave frame it will exercise a heavy damping effect, and the strength on the short waves will not be as good as it might be. Such powerful transmissions as the Regional stations, can of course, be received without difficulty, but if one is living any distance away, or if one endeavours to obtain foreign stations on the short-wave band, the results will be disappointing if the two frames are not sufficiently well separated.

Another effect which may occur, and which actually did occur on a second model of this receiver which I made up, was absorption round about 260 metres. This, of course, coincided with the National Brookmans Park transmission, and although this programme could be received owing to the proximity of the station, it was not possible to tune it in in the accepted sense of the



Although this is a suit-case type of set, the use of non-spill batteries allows the case to be placed on its side, as seen here. Alternatively, the cabinet may be fitted with a strap and used in the suit-case position



# The SUN PO

By J. H. REYNER,  
B.Sc., A.M.I.E.E.

## FRAME AERIAL DETAILS ::

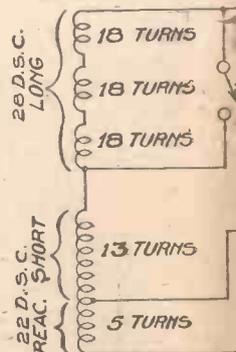
word. A carrier could not be found, and the tuning was of a very indefinite character. The removal of the long-wave sections of the frame to a greater distance away immediately overcame the trouble and the

**COMPONENTS REQUIRED FOR THE**

- Cabinet (Camco).
- Ebonite panel, 13 in. by 5 1/2 in. (Trolitax, Becol).
- Baseboard, 13 in. by 4 1/2 in. (Camco).
- .0005-mfd. drum-drive variable condenser with dial (left-hand) (Polar, Lotus, Burton, J.B., Ormond).
- Screen-grid valve-holder (W.B., Lotus, Junit, Bulgin, Parex, Benjamin).
- Two anti-microphonic valve holders (Lotus, W.B., Benjamin, Igranic).
- Two high-frequency chokes (Wearite, Lewcos, Bulgin type S.G., Watmel P.X.3, British General, Lissen)
- Low-frequency transformer (Varley Ni-core 11, Lissen, Telsen, Ferranti, Igranic, Lotus, Burton).
- 1-mfd. fixed condenser (Lissen, T.C.C., Dubilier, Hydra, Helsby).
- .0003-mfd. fixed condenser S.P. type (T.C.C., Dubilier, Watmel, Graham-Farish, Lissen, Atlas).
- 1-megohm grid leak (Lissen, Dubilier, Watmel, Igranic).

frame tuned sharply and crisply down to 250 metres. As a matter of fact, if any difficulty is experienced in obtaining adequate separation between the two frame sections, I should recommend the re-winding of the long-wave section in two slots and not three.

The use of the two



The connections

# SUNSHINE THREE PORTABLE

## AND SPEAKER OPERATING

slots, of course, gives a slightly less efficient long-wave frame owing to an increased self-capacity, but the difference is relatively small. Provided one can obtain the  $\frac{3}{4}$ -in. spacing the use of the three slots originally

### THE "SUNSHINE THREE PORTABLE"

.0002-mfd. fixed condenser (T.C.C., Lissen, Dubilier, Watmel, Graham-Farish, Atlas).  
.002-mfd. fixed condenser (T.C.C., Dubilier, Lissen, Atlas, Watmel, Graham-Farish).  
38-mmfd. reaction condenser with insulated spindle (Igranic).  
Two push-pull switches (Bulgin, Lissen, Lotus, Benjamin).  
Two panel-brackets (Lissen, Ready Radio, Camco).  
Special aluminium screen (Ready Radio, Parex, H. & B., P.B.).  
Loud-speaker unit and cone complete (Six-Sixty, Blue Spot, Lissen).  
Six wander plugs (Igranic, Springwire, Clix, Belling-Lee).  
Two spade tags (Clix, Belling-Lee).  
Four yards thin flex (Lewcos).  
Glazite for wiring.  
Two ounces 22 d.s.c. for short-wave frame aerial.  
Four ounces 28 d.s.c. for long-wave frame.

A specified will be found to be quite satisfactory.

Three flex connections are taken from the frame and are joined to the appropriate terminals on the battery. These connections run from the frame straight across the top of the accumulator, and they should be kept apart from each

WAVELENGTH CHANGING SWITCH

B

C

of the frame aerial

other as far as possible. This may be done by drilling three holes in the cover plate and cutting slots in the partition between the battery compartment and the chassis as shown in the photographs. Two other flex leads are brought from the loud-speaker across the right-hand side of the set on to the two loud-speaker terminals, and as no choke-output circuit has been used, care should be taken to get the negative and positive leads correctly connected.

### Operating

As regards the operation of the receiver, this is of a very simple character as I pointed out in the earlier articles. One must, of course, insert the correct valves in their respective places, a screen-grid valve for both H.F. and detector, and a suitable power valve for the last stage. The voltages specified for the H.T. points are not critical, but some improvement can be obtained by minor adjustments. It is best to tune in a fairly weak station, or alternatively to tune in a strong station and to set the frame at right angles to the direction of that signal, so that one obtains only a very small signal on which to work. The effect of altering the voltages can then be determined better than on a strong signal.

The screen voltage on the H.F. valve can be varied first. The best thing to do is to start with this voltage at about 80 volts and gradually to reduce it step by step, noting the effect on the signal. The smaller this screen voltage can be made, the less the current consumption of the valve, and therefore, the longer the high-tension battery will last. A point is reached, however, at which signal strength begins to fall off appreciably and one must call a halt. The actual screen voltage depends

The "Sunshine Three Portable" is very simple to operate, and is therefore ideal for out-of-door parties, where simplicity of tuning is an essential feature

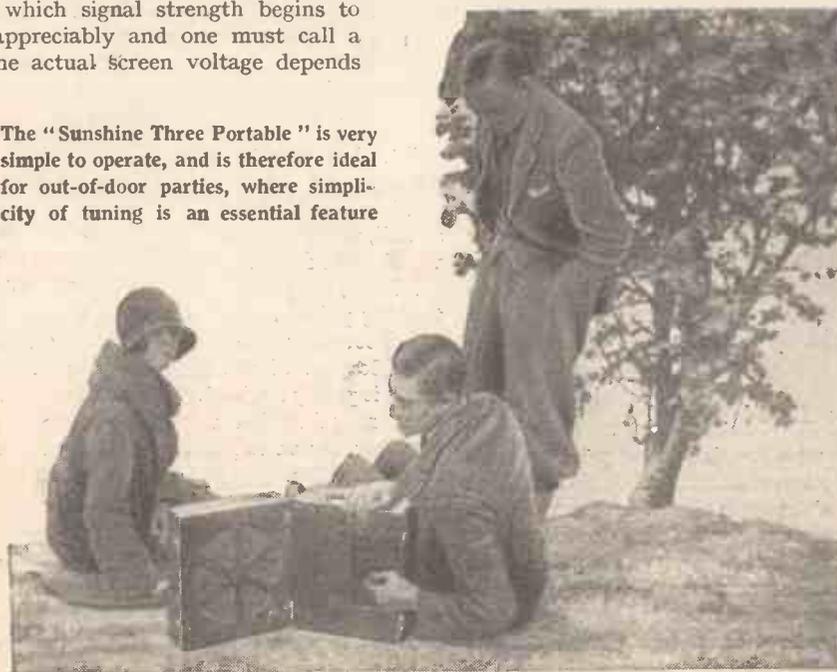


The receiver closed and ready for carrying

upon the valve in use, and more definite information cannot therefore be given.

The detector portion of the set can be experimented with to quite an appreciable extent. The conditions which seemed to me best were 60 volts on the anode and about 18 volts on the screen. It will be found that the screen voltage is not very critical, but that there are definite positions on the H.T. tapping which give better results. A little experiment will soon show which these positions are. I employed 60 volts on the anode with the object of reducing the anode current to some extent. No system of parallel feeding has been adopted and, therefore, it is not desirable to have too large an anode current flowing

(Continued on page 774)



# MY WIRELESS

Weekly Tips  
Constructional  
and  
Theoretical—



# DEN

By  
W. JAMES

For the  
Wireless  
Amateur

## Selecting a Resistance

A POINT to note when choosing resistances for use in a mains set or high-tension unit is the current-carrying capacity. Heat is, of course, produced in a resistance unit, being proportional to the current squared.

Some resistances will not carry sufficient current without overheating and perhaps burning out. The actual position of a resistance is a matter of some importance. It may be so constructed that it ought to be fitted in a certain way and in any event, a resistance can, with advantage, be put where it is not enclosed.

## A Handy Gadget

One of the most useful instruments that an amateur can have is a milliammeter reading, say, 0.2. I have one of these.

It may be connected in the anode circuit of a detector as a guide when tuning, or adapted for measuring larger currents and voltages. An 0.2 milliammeter will, for instance, read 0.6 volts when a fixed resistance of 3,000 ohms is connected in series with it. (Actually the resistance should be 3,000 ohms less the resistance of the meter, but the latter is usually negligible). For reading 0.120

volts, the series resistance should be 60,000 ohms, and other ranges may be obtained by using appropriate resistances.

A point to note is that the resistance value is obtained by dividing the voltage by the current taken by the meter and, as explained above, this value ought really to be reduced by the resistance of the instrument.

## Sets for 1931!

Those who are designing next season's sets have something to think about. Last season most people shouted for wave-traps when the Brookman's Twins started up.

But I do not think anyone is going to be satisfied with a new set which needs a wave-trap or any other external aid to selectivity. The wave-trap craze last season showed what a failure many sets were. This year's sets ought to provide the correct measure of selectivity for the magnification.

## The B.P.'s

One sometimes hears the remark—the National programme is much more loud than the Regional, from Brookman's Park, or perhaps the reverse is said to be the case.

This is a matter which may be adjusted by altering the aerial connection. Thus, if the aerial is joined to point A in the figure, the Regional may be heard at much greater strength than the National. But if the aerial is taken from point A to B, the reverse will probably be true.

The relative strengths at moderate distances depends largely upon the tapping

and its amplification factor is 1,500.

A good battery type screen-grid valve has a slope of one, or a little more. Therefore, it seems on the face of it, that the mains valve is 3.5 times as effective. Whether this is really true or not depends largely upon the value of the grid-anode capacity of the valve, and for this reason I consider the valve makers ought to include this quantity in their tables.

The capacity, being a very small one, is no doubt difficult to measure. For this reason the value of self-capacity given ought to be one found in an independent laboratory, where the various makes of valves could be tested under identical conditions.

I do not know whether the valve makers consider the users and their difficulties in fitting circuits to new valves. Maybe they are merely competing one with another. Anyhow, the valve position is becoming of great interest.

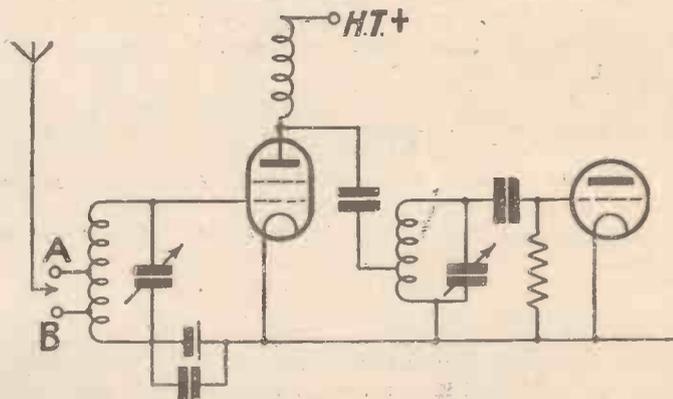
## Preventing a Blow-out

I find that many of the most keen amateurs fit a fuse in the negative high tension wire when trying a new set. This fuse, which may well be a flash-lamp bulb, will save the valves if the

high-tension is by chance applied to the filament circuit.

Should you remove the high-tension negative wire from the supply, however, and tap it on and off with the filaments either on or off, you may well be surprised to see the bulb glow momentarily. This is an indication of the charging current of the by-pass condensers and need occasion no alarm.

At the recent meeting of the International Broadcasting Union at Ouchy, near Lausanne, it was officially stated that the Postal Administration of Portugal and Radio-Ljubljana (Yugoslavia) had been admitted to active membership. In all, the Union now represents 330 transmitting stations serving about ninety million listeners. Vice-Admiral C. D. Carpendale, C.B., of the B.B.C., was elected president for the sixth successive year.



This is a simple method of adjusting the tuning circuit to suit reception conditions

point. I prefer to connect the aerial to point A, for then the total amplification, considering the behaviour of the circuit, as well, is likely to be more uniform over the wavelength range.

In fact, by properly arranging the aerial tapping point as well as that of the interval-coupling, the great falling off in the amplification of the longer waves in the range is partly avoided. The selectivity and total magnification should be considered together, for an excess of one of these is of no great value.

## Those "Super" S.G.'s

Screen-grid valves are becoming so effective that I really wonder at times when the limit will be reached.

There is news this week of a new mains valve of the indirectly-heated type having a mutual conductance of 3.5. The impedance of this screen-grid valve is 430,000 ohms,



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By  
**DOCTOR  
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# "A.W." TESTS OF APPARATUS

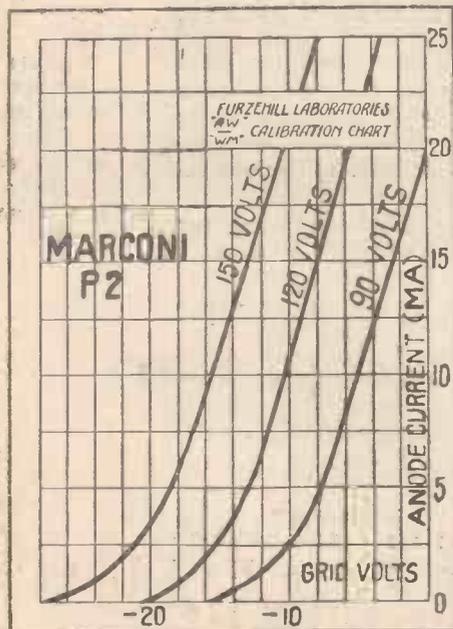
Conducted by our Technical Editor, J. H. REYNER, B.Sc. (Hons.), A.M.I.E.E.

## The Marconi P2 Valve

THIS week we are reporting on a new Marconi power valve. This new P2 valve is, as its designation implies, a 2-volt power valve actually consuming .2 of an amp.; yet the characteristics given below and the curve shown on this page indicate a performance much in excess of that expected from a valve of this type. In the first place the impedance is approximately 2,800 ohms, and the amplification factor between 6 and 7.

Thus the valve has the sensitivity of a normal power valve, with the volume capabilities of a super-power valve. An undistorted power output approaching ½ watt is to be expected with an H.T. potential of approximately 150 volts, and suitable grid bias. With an H.T. voltage of this order, however, the anode current will be approximately 14 milliamps; it is as well, therefore, to use large-capacity dry batteries for high tension.

This valve should certainly meet the need of a 2-volt output valve in the super-power class, and we expect there will be a considerable demand for it. It has capabilities of the same order as the 240 type of valve, with only half the filament current. It sells at 15s.

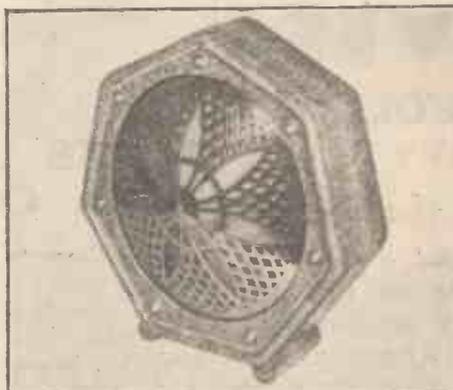


The characteristics of the Marconi P2 valve

## New Philips Speaker

THE standards for speakers have altered since the early days of broadcasting, for in those days, the power output from a low-frequency valve was small compared

with that obtained from a modern power valve, and in consequence the chief qualities of a speaker were its sensitivity and ability to give pleasing reproduction at low volume. Times have changed, however, and the greatly increased power output of low-frequency valves have accustomed us to a greater intensity of undistorted volume, and indeed a comparatively large volume of undistorted reproduction has far less disturbing effect than a smaller volume of distorted music. The raucous sound coming from the old type speakers, which was attributed to excessive volume, was really due in part to grossly overloading an inefficient

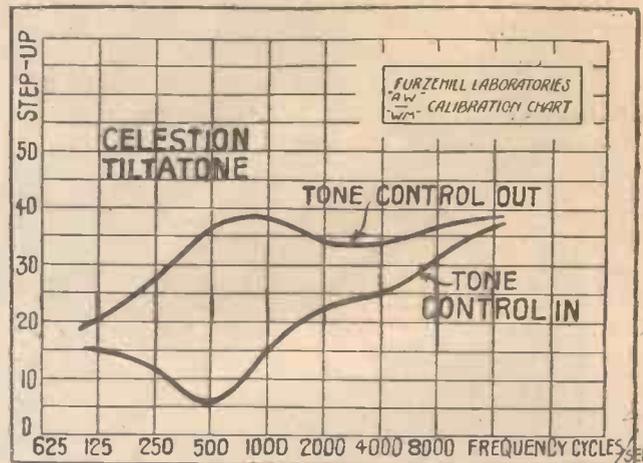


Of handsome appearance and high performance —the new Philips speaker

output valve, and partly to resonance in the speaker itself.

An excellent example of an up-to-date cone speaker has been submitted by Messrs. Philips Radio Ltd. The appearance of the speaker is rather unusual, but by no means unattractive. That such a pleasing design should have been evolved from a moulded cabinet and oxidised copper diaphragm shield is certainly an achievement, and this speaker with an outer casing in the form of a heptagon should prove a distinctive ornament to any room.

Internally the speaker consists of a particularly neat unit driving a 10 in. cone of suitably prepared paper. The cone is fully floated by a ring of flexible material at the periphery, and the general construction and protection of the speaker itself is admirably carried out. We should imagine that the speaker could be grossly mishandled



These two curves show the effect of the Celestion Tiltatone

without any damage to the diaphragm and unit.

The performance was in every way up to standard of the appearance. We have tested speakers of greater sensitivity, yet by comparison with our standard cone the difference is hardly perceptible. We are very favourably impressed with the quality of reproduction, and particularly with the power that can be successfully handled without any sign of rattle or blurring. An undistorted output of approximately 2 watts was applied to the speaker without distortion. The frequency characteristic appeared to be fairly uniform.

A noteworthy feature of this speaker is the provision of three alternative impedances on the magnet windings allowing a variety of output valves to be used with good results. A neat selector switch changes over from one impedance to another.

The price of this speaker complete is £5 ros. and it can be confidently recommended to readers.

## The Celestion Tiltatone

IT is recognised that while a good pick-up used with a high-grade amplifier will give a very pleasant result, the use of some form of tone correction is desirable in order to compensate for defects in the reproducing system. These are of two kinds, the deficiencies in the record such as the gradual cut off in the lower frequencies below 200 cycles, and the defects in the amplifier.

The use of a transformer between the pick-up and the amplifier will go a long way towards correcting these defects but one often finds that certain other undesirable results are introduced. Messrs.

*Continued on page 774*

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## "FOR QUALITY YOU MUST HAVE STABILITY" (Continued from page 767)

current may pass, that offered by the condenser is very much easier than that of the choke. The impedance of the choke over the usual broadcast frequencies is some thousands of ohms, and is thus much greater than the reactance of the condenser.

This combination is of particular value when a resistance-capacity low-frequency coupling is used, as in Fig. 2. In this circuit it is evident that any H.F. which passes the choke reaches the grid of the next valve.

### Transformer Coupling

With a transformer coupling the danger is not so great owing to the relatively low capacity of the two windings. There is also a further small capacity across the transformer, due to the windings, core and terminals.

In a transformer-coupled stage the single condenser of Fig. 1a is often good enough, but with a resistance stage the choke and condenser may have to be used. There are occasions when these parts do not provide a sufficiently effective means, and then it is necessary to add further stoppers. One which is commonly used, consists of a resistance connected to the grid of the first low-frequency valve, as in Fig. 3.

It depends to an extent upon the capacity of the valve to which it is connected. If the capacity is fairly high, such as 50 micro-microfarads, there is no need to use the higher value of resistance, for here again, the tendency is to cut off the high notes.

The stopping resistance is not called upon

to carry much current and may, therefore, take the form of a grid-leak type resistance.

In considering the action of the circuit, one may look upon the resistance as being in series with a condenser, which is formed by the electrodes of the valve and its behaviour in the circuit. Obviously, the high frequency will set up voltages across the resistance and condenser in proportion

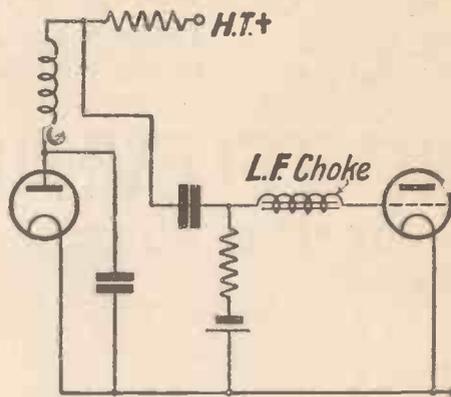


Fig. 4. A combination of by-pass condenser and stopping resistance

to their values. With a high resistance and large capacity, the greater part of the H.F. voltage in the circuit will be across the resistance and so little reaches the valve.

A combination of by-pass condenser and stopping resistance with a resistance coupling may lead to too much high-note cut off if fairly large condensers and resistances are used. The scheme of Fig. 4 is therefore of

interest, affording, as it does, good H.F. filtering and with parts of suitable value, high notes of the correct relative strength. The choke in series with the grid chokes back the H.F. currents and if it is made to resonate with the grid capacity at a fairly high audio frequency, will strengthen them.

This effect is useful, as the high notes are often weakened elsewhere in the circuit. A small condenser, such as one of 50 micro-microfarads may be added to the grid circuit to assist matters.

Further to improve stability, particularly in the case of a set giving great magnification, a condenser may be fitted between the anode of the power valve and its filament. This will help to minimise the flow of H.F. current through the loud-speaker leads and may not affect the tone to any extent. The impedance of a power valve is usually so low compared with that of a loud-speaker at the higher audio frequencies that a large condenser may often be used. A value of .005 microfarad may sometimes be fitted, but with a loud-speaker normally low toned, such a condenser would produce a noticeable effect.

In portable sets very complete H.F. stopping is necessary. The loud-speaker is usually near the aerial. Thus the input and output circuits are coupled and when H.F. currents show in the loud-speaker circuit, instability is almost bound to occur. We must also not forget that if H.F. currents are allowed to pass from the H.F. circuits to the H.T. supply, they may enter the low-frequency part of the set and cause trouble.

### "THE 'SUNSHINE THREE' PORTABLE"

(Continued from page 769)

through the primary of the L.F. transformer. If the anode voltage is kept fairly low, this current will not exceed about 2 milliamps which is quite a satisfactory value, but if the reader wishes to experiment he can increase the anode voltage somewhat, the screen voltage being correspondingly augmented.

On the subject of the detector it should be mentioned that the set will work very well for local stations if an ordinary valve is used as the detector, but as I pointed out in the preliminary articles I obtained a definite improvement from the use of the screen-grid type.

The last valve is, of course, biased in accordance with the makers' instructions to give the correct operating point. If desired a slight amount of over biasing may be employed in order to cut down the anode current consumption.

The tuning is very simple. Merely set the frame switch in the required position, switch on the set and rotate the tuning dial. Reaction can be applied with the

reaction control, in order to find the carrier, and if the circuits are adjusted correctly this reaction will be found to be very smooth in operation, while a further feature is that it does not alter the tuning very much.

### "A.W.' TESTS OF APPARATUS"

(Continued from page 772)

Celestion Radio Co., of loud-speaker fame, have just brought out a device called the Tiltatone which has several novel features.

It consists essentially of a step-up transformer with a tone-correcting circuit in the secondary circuit. The transformer steps up the voltage to a considerable extent and a choke is then inserted in series with the lead to the pick-up which causes a large reduction of the middle register.

The whole device is housed in a case measuring 6½ in. by 3¾ in. by 3½ in. high. The top panel has two input and two output terminals, and two controls, one operating the tone control just described and the other for adjusting the volume. On test the step-up in volume was immediately noticeable.

We were not so impressed with the volume control, which seemed to cut off the bass. Probably the makers were endeavouring to correct the usual fault of volume controls which is to cut off the treble, which is well maintained in the Tiltatone. The device sells at £4 17s. 6d.



Jack Pavne—a Slade impression



**G**EORGE CLARK, who with his sketch *The New Car* scored so great a success at the Royal Command Performance at the Palladium, will appear before the London Regional microphone on June 17.

On June 20, Mr. J. H. Thomas, Lord Privy Seal, will speak at the National Savings Assembly at Llandrindod Wells. He will be relayed to the National transmitters.

All B.B.C. stations will broadcast the opening performance of the Aldershot Command Searchlight Tattoo on June 17 when listeners will hear 1,000 musicians and 5,000 voices. Among the items to be relayed are the usual light cavalry evolutions, a pageant of the Battle of Dettingen and a scene showing Queen Elizabeth reviewing her troops.

For a special programme on June 16, a special orchestra of Chinese musicians is being engaged. The entertainment will include native dialogue as well as the national music of that country.

Henry Arthur Jones's melodrama *The Silver King* is being prepared for the microphone; although no definite date has yet been fixed the new version may be broadcast in July. The B.B.C. is also modernising Dumas' *La Dame aux Camelias* for transmission through the ether.

Although "Surprise Items" and "Diversions" have come to an end, the idea has not been abandoned, and they will make their reappearance in a vaudeville programme down for broadcast on June 16 through the National stations. Geoffrey Gwyther will be heard in this programme which also includes Marie Wilbraham's sketch *Time*.

Work on the B.B.C. North Regional Transmitter at Moorside Edge, near Huddersfield is being hurried forward; as a "resting place" for the engines a concrete bed weighing 600 tons was poured in the record time of thirteen-and-a-half hours.

In the National vaudeville programme for June 19 will be found the names of Stainless Stephen, Wish Wynne, Fred Lewis, Mabel Marks, and the Three Gias (syncopated singers).

On June 24, when the Irish Derby is run at the Curragh, another opportunity will be provided for linking up the North and South broadcasting systems of Ireland. It will form the subject of a running commentary arranged by Dublin and relayed to the Belfast B.B.C. station.

The recently constructed transmitter at Prangins near Geneva (Switzerland) has now been placed at the disposal of the League of Nations by the Swiss Government. It has cost over one million Swiss francs and is to be used when required by the International Labour Bureau, the Red Cross and for Press services. In ordinary peace times the transmitter will be operated by Radio Suisse under the direct supervision of a representative of the League of Nations, but so soon as an International crisis arises the station will revert to the care of the League of Nations, which will be entirely responsible for its transmissions. All broadcasts will be carried out on 4,400 metres with a power of some 50 kilowatts in the aerial.

In the United States of America visitors to the high power transmitting stations have been warned to leave their watches at home as these, when brought into the vicinity of stations in operation, run the risk of becoming magnetized.

An interesting experiment is to be carried out on Sunday, June 22, at 9.20 a.m. B.S.T. by the Frankfurt broadcasting station. On that day, in co-operation with the local automobile club, the transmitter will broadcast an imaginary "theft" of three motor-cars from three specified streets in that city. Members of the club taking part in the competition will equip their cars with receiving apparatus in order to receive messages from the local transmitter every fifteen minutes informing them of the route taken by the car thieves. Listeners in the city and suburbs are requested to telephone the studio in the event of their discovery of the "illicit" joy-riders. Although no prizes are offered it is interesting to note that the authorities, with a view to securing the co-operation of the public, are stating their willingness to refund the cost of the telephone calls.

In a letter to the Wireless Retailers' Association of Great Britain, the chairman of the Scottish Radio Retailers' Association declares that the situation in regard to hours of transmission is becoming impossible so far as Scotland is concerned. "We have an hour's Scottish transmission three mornings in the week," he states. "In the past Daventry was our mainstay; now Daventry comes on at four-o'clock. We have repeatedly made complaints, but every year the daytime transmissions are being further curtailed, especially at the holiday season. It is very difficult indeed to service sets with the present facilities."





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Complete with 2 fuses.

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There is no need to lose any of your radio enjoyment in the summer. Equip your set—Mullard Master 3, Britain's Favourite 3, Britain's Broadcast 2, Wavelets 2, etc.—with Tunewell Ultra Short Wave Coils and you will get really good performance, long range and selectivity.

### TUNEWELL MAGNETIC REACTION ULTRA SHORT WAVE COILS

20/45 metres ... **3/11** each  
40/90 metres ... **3/11** each

Tunewell 2-pin Ultra Short Wave Coils boxed in sets of four sizes ... **6/-**

Tunewell Ultra Short Wave Coils for screened grid sets (Valve-holder fitting or 6-pin base fitting) ... **3/11** each

Tunewell range of Speakers, including plaque type, from 28/6 to 42/-.

Tunewell "Cut-out" 10/6

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Tunewell Special New H.F. Choke, 6/6.

Send for List

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# BROADCAST TELEPHONY

Broadcasting stations classified by country and in order of wavelengths. For the purpose of better comparison, the power indicated is *aerial energy*.

Metres	Kilo-cycles	Station and Call Sign	Power (Kw.)	Metres	Kilo-cycles	Station and Call Sign	Power (Kw.)	Metres	Kilo-cycles	Station and Call Sign	Power (Kw.)
<b>GREAT BRITAIN</b>				<b>GERMANY</b>				<b>NORTH AFRICA</b>			
25.53	11,751	Chelmsford (5SW)	15.0	294.6	1,018	Limoges (PTT)	0.5	363.4	825.3	Algiers (PTT)	16.0
*200	1,500	Leeds	0.13	306	980	Bordeaux (PTT)	1.0	416	720	Radio Maroc (Rabat)	10.0
*242	1,238	Belfast	1.0	309	970	Radio Vitus	1.0	1,250	240	Tunis Kasbah	0.5
*261	1,148	London Nat.	30.0	*315	952	Marseilles (PTT)	0.5	<b>NORWAY</b>			
*288.5	1,040	Newcastle	1.0	329	914	Poste Parisien	0.5	304	824	Bergen	1.0
288.5	1,040	Swansea	0.13	329	914	Grenoble (PTT)	0.5	368	813	Frederiksstad	0.7
288.5	1,040	Stoke-on-Trent	0.13	370.4	810	Radio LL (Paris)	0.5	445	674	Rjukan	0.18
288.5	1,040	Sheffield	0.13	*381	788	Radio Toulouse	8.0	453	662	Aalesund	0.3
288.5	1,040	Plymouth	0.13	447	671	Paris (Etat)	3.0	453	662	Tromsø	0.1
288.5	1,040	Liverpool	0.13	466	644	Lyons (PTT)	5.0	453	659.3	Porsgrund	0.7
288.5	1,040	Hull	0.13	1,446	207	Eiffel Tower	12.0	*493	608	Oslo	60.0
288.5	1,040	Edinburgh	0.35	*1,725	174	Radio Paris	16.0	<b>POLAND</b>			
288.5	1,040	Dundee	0.13	<b>GERMANY</b>				214	1,400	Warsaw (2)	2.0
288.5	1,040	Bournemouth	1.0	*218	1,373	Flensburg	0.5	234	1,283	Lodz	1.5
288.5	1,040	Bradford	0.13	*227	1,319	Cologne	4.0	*313	959	Cracow	0.5
*301	995	Aberdeen	1.0	*227	1,319	Münster	3.0	*335	896	Posnan	1.2
*310	968	Cardiff	1.0	*239	1,256	Nürnberg	2.0	385	779	Wilno	0.5
*356	842	London Reg.	30.0	*232.2	1,292	Kiel	0.35	385	779	Lvov	2.0
*377	797	Manchester	1.0	214	1,227	Cassel	0.25	*408	774	Katowice	10.0
*399	753	Glasgow	1.0	*253	1,184	Gleiwitz	2.0	1,411	212.5	Warsaw	8.0
*479	626	Midland Reg.	25.0	*259	1,157	Leipzig	2.5	<b>PORTUGAL</b>			
1,554	193	Daventry (Nat.)	25.0	*270	1,112	Kaiserslautern	0.25	320	937.6	Lisbon	2.0W
<b>AUSTRIA</b>				*276	1,085	Königsberg	2.5	<b>ROUMANIA</b>			
*246	1,220	Linz	0.5	*283	1,058	Magdeburg	0.5	*304	761	Bucarest	12.0
*283	1,058	Innsbruck	0.5	*283	1,058	Berlin (E)	0.5	<b>RUSSIA</b>			
*352	851	Graz	7.0	*283	1,058	Stettin	0.5	720	416.6	Moscow (PTT)	20.0
*453	666	Klagenfurt	0.5	*315.8	951	Bremen	0.35	800	375	Kiev	20.0
*517	581	Vienna	15.0	*320	937.6	Dresden	0.25	824	364	Sverdlovsk	25.0
<b>BELGIUM</b>				*325	923	Breslau	1.5	938	320	Moscow-Stchekovo (C.C.S.P.)	100.0
206	1,460	Antwerp	0.4	*360	833	Stuttgart	1.5	1,000	300	Leningrad	20.0
235.5	1,273.5	Chatelineau	0.25	*372	806	Hamburg	1.5	1,080	283	Tiflis	10.0
224	1,229	Binche	0.3	*390	770	Frankfurt	1.5	1,073	279	Rostov (Don)	10.0
244.7	1,226	Ghent	0.25	*418	716	Berlin	1.5	1,103	272	Moscow Popoff	40.0
246	1,218	Schaerbeek	0.25	*453	662	Danzig	0.25	*1,304	230	Kharkov	25.0
338	887	Forest	3.0	*473	635	Langenberg	15.0	1,380	217.5	Bakou	10.0
*509	590	Brussels	1.0	*533	563	Munich	1.5	1,500	200	Moscow (Kom)	40.0
<b>CZECHO-SLOVAKIA</b>				560	536	Augsburg	0.25	<b>SPAIN</b>			
*263	1,139	Moravska-Ostrava	10.0	*566	529	Hanover	0.35	251	1,195	Barcelona (EAJ15)	1.0
*279	1,076	Bratislava	12.5	569	527	Freiburg	0.35	206.5	1,126	Barcelona (EAJ13)	10.0
*293	1,022	Kosice	2.0	*1,035	183.5	Zeessen	20.0	*340	860	Barcelona (EAJ1)	8.0
*342	878	Brunn (Brno)	2.4	1,649	182	Norddeich	10.0	368	815	Seville (EAJ5)	1.5
*437	617	Prague (Prah)	5.0	<b>HOLLAND</b>				424	707	Madrid (EAJ7)	2.0
<b>DENMARK</b>				31.28	9,599	Eindhoven (PCJ)	30.0	492	649	San Sebastian (EAJ8)	0.5
*281	1,067	Copenhagen	0.75	*299	1,004	Hilversum (between 11.40 a.m. and 5.40 p.m. B.S.T.)	0.5	<b>SWEDEN</b>			
1,153	260	Kalundborg	7.5	*1,071	280	Hilversum	0.5	231	1,301	Malmö	0.6
<b>ESTHONIA</b>				*1,071	280	Scheveningen-Haven	5.0	*257	1,160	Hörby	10.0
*296	1,013	Reval (Tallinn)	1.5	*1,875	160	Huizen	6.5	290	1,903	Falun	0.5
<b>FINLAND</b>				<b>HUNGARY</b>				322	932	Göteborg	10.5
*221	1,355	Helsinki	10.0	210	1,430	Budapest (Csepel)	1.0	436	689	Stockholm (tests)	60.0
*1,706	167	Lathi	50.0	550	545	Budapest	20.0	*542	554	Sundsvall	1.0
<b>FRANCE</b>				<b>ICELAND</b>				*770	389	Ostersund	0.6
20.7	10,180	Radio Experimental (Paris)	1.4	*1,200	250	Reykjavik (shortly testing)	10.0	1,251	239.8	Bodn	0.6
175	1,714	St. Quentin	0.1	<b>IRISH FREE STATE</b>				*1,348	222.5	Motala	30.0
219	1,370	Beziers	0.3	*225	1,337	Cork (IFS)	1.0	<b>SWITZERLAND</b>			
223	1,346	Fécamp	0.7	*413	725	Dublin (2RN)	1.0	*403	743	Berne	1.0
2:9	1,255	Nimes	0.25	25.4	11,870	Rome (3RO)	0.0	*459	653	Zurich	0.63
237	1,205	Bordeaux (Radio Sud-Ouest)	1.0	291	1,030	Turin (Torino)	7.0	678.7	442	Lausanne	0.6
249	1,205	Juan-les-Pins	0.5	332	905	Naples (Napoli)	1.5	780	395	Geneva	0.25
256	1,171	Toulouse (PTT)	1.5	386	777	Genoa (Genova)	1.0	1,010	297	Basle	0.25
265	1,130	Lille (PTT)	0.7	*441	680	Rome (Roma)	50.0	<b>TURKEY</b>			
268	1,121	Strasbourg	0.7	453	662	Bolzano (IBZ)	0.3	*1,220	245.9	Istanbul	5.0
*272	1,102	Rennes (PTT)	0.5	*501	599	Milan (Milano)	7.0	1,961	153	Ankara	7.0
2:6	1,0:9	Radio Lyons	0.5	<b>ITALY</b>				<b>YUGOSLAVIA</b>			
*287	1,040	Montpellier (PTT)	0.3	*525	572	Riga	7.0	306	68	Zagreb (Agram)	0.7
				<b>LATVIA</b>				432	694	Belgrade	2.5
				<b>LITHUANIA</b>				574.7	522	Ljubljana	2.5
				*1,935	155	Kaunas	7.0				

All wavelengths marked with an asterisk have been allotted according to the Plan de Prague.

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CN.9	00015

**GERRARD**  
1863

**GOLDEN SQUARE, PICCADILLY CIRCUS, LONDON.**

Every effort is being made by Nice-Juan-les-Pins to collect sufficient capital for the erection of a high-power transmitter on the French Riviera. Reports state that the organisers consider a power of 25 kilowatts and that an attempt will be made to get it into operation during the coming summer. Arrangements have been concluded to install the studio in one of the principal hotels on the *Promenade des Anglais* at Nice.

The Italian Broadcasting authorities will relay the main concerts which are to be given at Venice during the International Music Festival taking place in that city during the period September 8-15.

The proprietors of sixteen radio stations

in America will shortly be summoned to a hearing in Washington to determine whether they shall be permitted to continue broadcasting. In each case the station has violated laws or regulations. They have all been put on probation for this month.

The *Graf Zeppelin*, now on a world's tour will probably be heard in England. The call letters are DENNE. The short-wave transmitter will work on 35.4, 53, and 26 metres, and the long waves on 2,150 and 1,945 metres.

The Mull under-sea service cable has now been restored, and, in consequence, the temporary wireless station at Oban has again been dismantled.

# CONVERTING YOUR SET TO DUAL-RANGE WORKING

*A simple explanation of new six-pin coils which can easily be changed from one waveband to another*

MANY readers have in their possession receivers using six-pin coils. These coils are usually of the interchangeable variety, so designed that one can alter one's range of reception from long to short waves or vice versa, by removing one coil and replacing it with a corresponding type suitable for the other waveband. Indeed some of the most popular receivers ever put out, utilised this form of coil some years ago. I have in mind the original Solodyne receiver, for example, which was one of the first receivers ever designed incorporating six-pin coils.

### Six-pin "Q" Coils

In an attempt to overcome the necessity for changing these coils the London Electric Wire Co. have brought out a series of six-pin "Q" coils which are similar to the well-known standard type of "Q" coil, with the exception that no switch is incorporated, the connections being brought out to the six pins so that the coil plugs into a standard six-pin base. Two sockets are provided on the top, joined with a short link. This link is in position for the short waves,

and is removed for the long waves. One can change the range, therefore, simply and easily without removing the coil by simply altering the connections of this link, or by taking two leads from the appropriate sockets on top of the coil to a switch on the panel. The wavechange can then be carried out by operating this switch from the outside of the set, without any necessity for lifting the lid.

### Three Types

The coils are of three types. First of all there is an aerial coil, which is of the aperiodic type, and is known as the SP/QAT. This coil will be found to be rather more selective on the short waves than the customary six-pin coil, with a corresponding reduction in the signal strength. On the long waves it is equivalent to the standard six-pin aerial coil.

There are also two high-frequency transformers, one suitable for triode valves, and provided with a split-primary neutralising circuit. The connections of this coil are provided the same as on the standard split-primary transformer, so that no alteration

to the connections is necessary, the SP/QSP coil being inserted instead of the standard six-pin transformer.

Finally there is the screened-grid transformer (SP/QSG), which is suitable for the modern screen-grid valve. This is provided with a primary winding connected between pins 3 and 4, the secondary being connected between 1 and 2, as usual. The reaction winding is quite separate and is connected between pins 5 and 6. This method of connection is exactly the same as the standard "Q" coil.

Any readers who have a set using six-pin coils, should write to Messrs. The London Electric Wire Co., for their leaflet No. R63, which not only contains details of the coils and their connections, but also gives a long list of over fifty receivers in which these coils can be used. Many well-known AMATEUR WIRELESS receivers figure in the list, such as the "C.T. Four," the "One-control Three," "Britain's Favourites" and so on, while many popular *Wireless Magazine* sets like the "Revolution Four" may be converted to dual-range working by the use of these six-pin "Q" coils. J. H. R.

**Don't 'accumulate' batteries**

A receiver no longer requires attendant batteries for its power. A mains unit is more reliable, more efficient. Build one to-day with



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- Loud-speaker Crystal Sets.
- Wireless-controlled Mechanism for Amateurs.
- The Short-wave Handbook.

- The Wireless Man's Workshop.
- The Practical "Super-het" Book.
- The Practical Wireless Data Book.

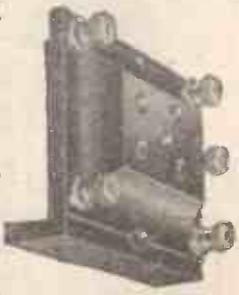
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Universal 4-pin Valve Holder.

Specified in the A.C. Mains Unit described in this issue.

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# JUNIT

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Obtainable from usual suppliers.

Made by JAMES NEILL & CO. (Sheffield) LTD. Crucible Steel Manufacturers, Sheffield.

5 for 1/8      3 for 1/4

# LETTERS TO THE EDITOR



The Editor does not necessarily agree with the views expressed by correspondents.

Correspondence should be brief and to the point and written on one side of the paper.

## Broadcast Gramophone Records

SIR.—It seems odd that there should be so much prejudice against "canned" radio music. There are many records which the average listener cannot afford to buy and which would provide better entertainment than some of the B.B.C. turns. After all it does not matter much whether one hears, say, Chaliapin over the microphone or on a record. There are many people who would prefer to hear broadcast records of famous people rather than never hear these people at all.

Of course, there is a world of difference between extensive gramophone broadcasting as it might conceivably be done by the B.B.C., and as it is at present done by many Continental stations, the worn out records at which are a constant disgrace to the ether. There is much that the B.B.C. might do to improve its gramophone broadcasts, but the main point is that the money available could easily provide for a first-class stock of records. I seem to remember reading in AMATEUR WIRELESS some time ago that the B.B.C. uses no scratch filter, and apparently the engineers have a long way to go before they come up to the standard set by some amateur transmitters in the broadcasting of records.

B. F. (Finchley).

## The "A.W." Paper Speaker

SIR.—Having just made up your paper speaker, as described recently, I should like to thank you for the excellent work in giving details of this speaker. I have kept to the details given, but I have made my framework of 3/8 in. deal, and the unit is a W. and B.

When finished and connected to a three-valver, purity is amazing and volume has to be reduced. After using a large-size cone and chassis, I am disgusted with it at the side of your paper-speaker, and would not use any other type but the paper speaker.

G. W. (Nottingham).

## "Music Leader" Results

SIR.—From time to time I have heard of readers who have constructed the "Music Leader," and have not been getting very good results. I have had this receiver working for about four months and have nothing but praise for it. English and foreign stations come in at great strength on both wavelengths.

I found that the set must be constructed according to the blueprint and the information supplied in detail. I have had to dis-

mantle the set on two occasions, on account of not working to exact details given.

W. S. (Rugby).

## Four-hour Items!

SIR.—In "Current Topics" in AMATEUR WIRELESS No. 416 you say, "What other broadcasting corporation would dare to give four unbroken hours of *Das Rheingold*?" Well, it is only a few weeks since I listened to four hours of *Götterdämmerung*. I forget which foreign station it was radiated from as the station of origin, but the barrage extended over a wide front, and I received it from at least three relays—and enjoyed it. It was a public performance, thoroughly appreciated by the audience in the opera house, and certainly by many thousands on their speakers—although I fear not many of the listeners were in this country.

T. A. C. (London, S.W.16).

## "SIMPLE IMPROVEMENTS TO YOUR SET"

(Continued from page 759)

long leads can conveniently reach to the terminals at the back of the meter.

Every fortnight or so, when taking the accumulator out to be charged, I lift the lid of the set and note the reading of the milliammeter to see that all is well. On two rare occasions a slight increase in the normal reading showed that the G.B. battery was running down, and a greater demand was therefore being made on the H.T. battery. Shifting the positions of the G.B. wander plugs brought the consumption down to normal and I maintain that the saving in the H.T. consumption has already paid for the cost of the milliammeter.

When I fitted a gramophone pick-up, and showed the family how to work it, I had a feeling that it would not be long before something would "gang aglay"; which it did by someone being so confused with the electric gramophone motor and self-stop that they forgot to switch off the set on one occasion.

To prevent this happening again I fitted a double-pole double-throw switch for the pick-up. One pole (and "two throws") controls the pick-up connections and the other side of the switch brings into circuit, when the pick-up is "on," a small flash-lamp in a motor-car fascia-board lamp-holder on the panel, and the glow of this is an obvious warning that the set is still switched on.

**FULL-SIZE BLUEPRINTS**

When ordering, please send Postal Order, NOT STAMPS

**CRYSTAL SETS (6d. each)**

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- Regional Crystal Set .. .. . WM176

**ONE-VALVE SETS (1s. each)**

- B.B.C. Official One .. .. . AW208
- A.1 .. .. . WM157
- Hartley Single-valver .. .. . WM198

**TWO-VALVE SETS (1s. each)**

- Loud-speaker America Two .. .. . AW190
- Talisman Two (D, Trans) .. .. . AW194
- British Broadcast Two (D, Trans) .. .. . AW215
- Easy-tune Two (D, Trans) .. .. . AW226
- Wavelets Two (D, Trans) .. .. . AW229
- No-battery A.C. Mains Two (D, Trans) .. .. . AW230
- Brookman's Two (D, Trans) .. .. . WM168
- Programme Two (D, Trans) .. .. . WM177
- New Crusader (D, Trans) .. .. . WM182
- Radio-Record Two (SG, D) .. .. . WM187

**THREE-VALVE SETS (1s. each)**

- All-wave High-mag. Three (D, 2 Trans) .. .. . AW199
- Knife-edge Three (D, RC, Trans) .. .. . AW201
- Talisman Two-three (D, RC, Trans) .. .. . AW203A
- Wide World short-wave Three (HF, D, Trans) .. .. . AW207
- Everybody's Three (SG, D, Trans) .. .. . AW209
- 1930 Ether Searcher (SG, D, Trans) .. .. . AW211
- New All-Britain Three (HF, D, Trans) .. .. . AW214
- Best-by-Ballot Three (SG, D, Trans) Price 4d. free with copy of "AW" .. .. . AW217
- Everybody's By-pass Three (D, 2 Trans) .. .. . AW220
- Everybody's all-electric Three (SG, D, Trans) .. .. . AW221
- A.C. .. .. . AW223
- 1930 Clarion Three (SG, D, Trans) .. .. . AW225
- Auto-coupler Three (D, 2LF) .. .. . AW233
- Beginner's Regional Three (D, 2LF) .. .. . WM117
- Standard Coil Three (HF, D, Trans) .. .. . WM157
- Fanfare (D, 2 Trans) .. .. . WM161
- Brookman's Three (SG, D, Trans) .. .. . WM164
- Community Three (D, RC, Trans) .. .. . WM167
- New Q3 (SG, D, Pentode) .. .. . WM170
- Brookman's Push-Pull Three (SG, D, Trans) 1/6 .. .. . WM173
- Celerity Three (SG, D, Trans) .. .. . WM178
- All-nations Three (D, 2 Trans) .. .. . WM179
- Inceptordyne (SG, D, Pentode) .. .. . WM184
- Brookman's A.C. Three (SG, D, Trans) 1/6 .. .. . WM190
- Music Marshal (D, 2 Trans) .. .. . WM196
- Gramo-Radio D.C. Three (SG, D, Trans) .. .. . WM199
- Concert Three (D, 2 Trans) .. .. . WM199

**FOUR-VALVE SETS (1s. 6d. each)**

- Clarion All-electric Three (SG, D, Trans—A.C. Rectifier) .. .. . AW200
- Music-Lover's Gramo-radio (SG, D, RC, Trans)—1s. 6d. .. .. . AW202A
- Music-Lover's Gramo-radio (Loud-speaker)—1s. .. .. . AW202B
- Standard-coil Four (HF, D, 2 RC) .. .. . WM122
- Dominions Four (2SG, D, Trans) .. .. . WM134
- Arrow (SG, HF, D, Trans) .. .. . WM154
- 1930 Monodial (2SG, D, Trans) .. .. . WM158
- Electric Four (All A.C.—SG, D, RC, Trans) .. .. . WM162
- Outpost Four (SG, D, 2 Trans) .. .. . WM165
- Brookman's Four (2SG, D, Trans) .. .. . WM174
- Transportable Four (SG, D, 2, RC) .. .. . WM180
- Super Q (SG, D, 2 Trans) .. .. . WM180
- Lodestone Four (HF, D, RC, Trans) .. .. . WM193
- Searcher's Four (SG, D, RC, Trans) .. .. . WM194

**FIVE-VALVE SETS (1s. 6d. each)**

- James Quality Five (2SG, D, RC, Trans) .. .. . AW227
- All-wave Lodestone Five (HF, D, RC, Push-pull) .. .. . WM146
- 1930 Five (2HF, D, RC, Trans) .. .. . WM171
- Dual-screen Five (2SG, D, RC, Trans) .. .. . WM185
- Radio-Record Five (SG, D, Trans-parallel) .. .. . WM188
- Overseas-Five (3SG, D, Trans) .. .. . WM191

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- Trimmer (Selectivity Unit) (6d.) .. .. . WM181
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- Pedlar Portable Two (D, Trans) .. .. . WM195 1/2
- Pedlar Portable Three D, 2 Trans) .. .. . WM197 1/-

Copies of the "Wireless Magazine" and of "Amateur Wireless" containing descriptions of any of these sets can be obtained at 4s. 3d. and 4s. respectively, post free. Index letters "A.W." refer to "Amateur Wireless" sets and "W.M." to "Wireless Magazine" sets.

**AMATEUR WIRELESS** 58-61 FETTER LANE LONDON, E.C.4

**EXPERIENCES OF AN "O.B." ENGINEER**

VARIETY is the spice of the work of engineers engaged in outside-broadcast and public-address work. One day we may have to arrange for the amplification of banquet speeches to a company of fifty or less, and the next day cater for 50,000 or more at a national opening ceremony.

The gear used on these occasions is of widely different types. For small jobs one usually takes an amplifier which is connected to the light supply. This with a microphone and speaker or two, usually suffices. The larger jobs, however, call for more complicated gear and greater organisation. Then we use an outfit which is entirely self-contained, generating all its own power.

I can well remember an episode which occurred prior to a broadcast in the North of England a year or so ago, which was attended by Royalty. The event was so important that a breakdown could not under any circumstances be risked. So I went to the City Engineer's Department and after much persuasion got him to lend us a 4-kw. generator and a steam-roller! I went back to make arrangements for the laying down of the lines for the "juice" which was to be supplied by the borrowed generator with the steam-roller flywheel as the motive force. Midnight came, but no steam-roller or generator, so I dashed into the city some ten miles away and found them in trouble over the raising of steam! Ultimately everything was fixed, but it was not until two hours before opening time that all was reported O.K.

**Dangerous Valves!**

One mid-summer day last year, found us at a town in the Midlands where we were dealing with music and announcements at an open-air fête. The public were so interested in the apparatus that ultimately we were forced to rope it off to keep the crowd back. Two dear old ladies gazed at the collection of gear which at the time was carrying some thousands of volts. One spotted the rectifying valve of the main amplifier which when operating throws off a blue glow.

Turning to her sister, she said: "There you are, my dear, didn't I tell you that they worked these machines off methylated spirits. They are so dangerous—we'd better come away."

Often on big jobs we receive requests from the public for all kinds of S.O.S. messages. Lost dogs, cats, and canaries have all figured in messages which have never reached the microphone. Cranks, too, can be a nuisance.

There are few people who know how to use a microphone properly. Some either shout or else speak too softly. Often the engineer on control is caused some anxious moments by a particularly raucous voiced individual who bellows and thunders at the sensitive "mike."

S. W.

**H. & B.**

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- 2 H.F. chokes (Wearite) .. .. . 12 6
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- 1 .0003 mfd. fixed condenser S.P. type (T.C.C.) .. .. . 2 3
- 1 1 meg. grid leak (Lissen) .. .. . 1 0
- 1 .0002 mfd. fixed condenser (T.C.C.) .. .. . 1 3
- 1 .002 mfd. fixed condenser (T.C.C.) .. .. . 1 9
- 1 Reaction condenser with insulated spindle (Igranite) .. .. . 5 6
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- 2 Spade ends (Belling-Lee) .. .. . 9
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Cash Price **£3 13 7**

Included in this kit are the necessary wire, screws, blueprint, frame aerial wire, and panel drilled.

**ANY PARTS SOLD SEPARATELY.**  
3 specified Mullard or Cosor valves 57/6 extra.  
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Blue Spot 66K unit 25/- or H. & B. special portable speaker unit 11/6.

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CABINET in hand-polished oak, made exactly to specification, together with baseboard and frame aerial fittings 35/-. CABINET as above with aerial wound and fitted with H. & B. SPECIAL LOUD SPEAKER UNIT AND CONE 50/-.  
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**OUR BLUEPRINT SERVICE**

Constructors of receivers described in this journal should make full use of our Blueprint Service and avoid all risk of failure.

**MORE RADIOGRAMS**

THE Italian authorities have adopted a practical method for the detection of radio pirates—no less than a general census in the principal cities and towns of the country. They have distributed to all the house-porters of flats and apartment houses printed questionnaires which are to be filled up and forwarded to the nearest post office.

Will Rogers, America's cowboy humorist and commentator extraordinary on the Columbia network, appeared in a single programme recently for which the remuneration was said to have been £3,000. Shortly after this it was announced that he had signed a thirteen-week contract to appear once a week over the Columbia network for £2,000.

The middle western states, U.S.A., lead in the number of broadcasting stations and total amount of power. There are 155 stations, utilising 325,265 watts of power. The first zone, which includes New York, ranks second with a present total amount of power 307,225 watts distributed between 111 stations.

As usual, a series of relays from the General Assembly in Edinburgh, of the Church of Scotland, has been arranged for Scottish listeners this year

Mabel Constanduros is the authoress of a new comic opera "en casserole" entitled *The Dragon's Bride*; it will be broadcast from the London and Midland Regional stations on June 21. The cast includes George Pizzev, Colleen Clifford, Dorothy Summers, Donald Davies, and Harold Clemence.

Bulgaria, one of the only European countries which does not possess a broadcasting system, will shortly erect a 10-kilowatt station at Sofia.

**When Asking Technical Queries**

PLEASE write briefly

A Fee of One Shilling (postal order or postage stamps) must accompany each question and also a stamped addressed envelope and the coupon which will be found on the last page. Rough sketches and circuit diagrams can be provided for the usual query fee. Any drawings submitted should be sent on a separate sheet of paper. Wiring plans and layouts cannot be supplied. Queries cannot be answered personally or by telephone.

Broadcasting station WFBL, Syracuse, N.Y., recently broadcast on three wavelengths in one day. It was operating on 1,490 kilocycles when the Federal Radio Commission changed it to 900 kilocycles. Then the Commission ordered it to be changed to 1,360 kilocycles.

A five-year plan of the Commissariat for Posts and Telegraphs in Soviet Russia provides for the installation of 13,000,000 receiving units during the period up to 1932-33, of which 9,000,000 will be equipped with loud-speaking units and 4,000,000 with telephone receivers. Last year there were 410,000 receiving sets in use.

Similar to the broadcasts made by the B.B.C., the Swedish transmitters transmit every week-end information supplied by the Royal Stockholm Automobile Club with regard to the state of the motoring roads.

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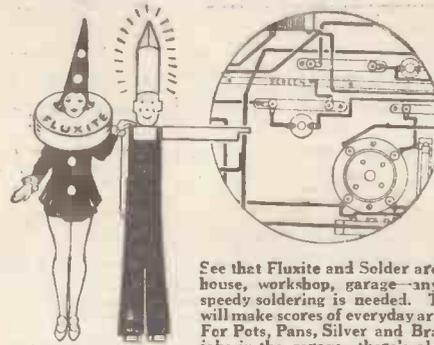
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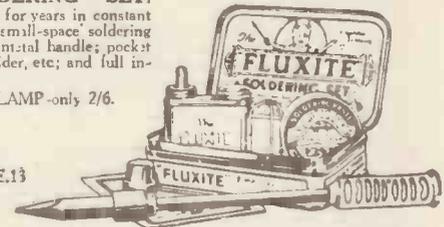
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